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Consolidated Announces New Wage Increase

Wage Increases Up To Three Cents Per Hour At Four Mills of Consolidated Water Power & Paper Co. Announced By Company — Fire Destroys Former Little Chute Pulp Mill—Reports Fine Safety Record.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., February 12, 1940—Wage increases went into effect Sunday, February 11, at the four mills of the Consolidated Water Power and Paper Company at Wisconsin Rapids, Biron, Stevens Point and Appleton, Wis., according to announcement made last week.

The pay boosts are three cents per hour in the lower brackets, and two cents per hour in the upper brackets, and two cents per hour for women workers.

Base hourly rates will now be a minimum of 56 cents except for the six-month starting rate of 53 cents per hour for new employees on common labor.

The agreement was negotiated at the company's general office at Wisconsin Rapids between company officials and international union representatives of paper makers, pulp and sulphite workers, machinists and electricians.

Renewal of the annual contract between the company and the unions will take place sometime before May 1st, and will embody the present wage increases.

Work on Kimberly-Clark Bridge Progressing

Construction work on the concrete bridge being built by Kimberly-Clark Corporation across the Fox River canal at Neenah, Wis., is proceeding ahead of schedule despite storms and cold weather. The piers and abutments are almost done and work will soon be started on the bridge proper. The work is being done by Fluor Brothers Construction Company, Oshkosh, Wis.

After completion of the bridge so as to provide a needed secondary outlet for truck traffic to the company's Lakeview mill, the way will be cleared for the expansion program which includes remodelling and enlargement of the Badger-Globe mill. When the changes have been made, the company will transfer manufacture of insulation material from Niagara Falls, N. Y. to the Neenah plant.

Former Little Chute Pulp Building Burns

A fire which broke out Friday afternoon, February 9, destroyed the former Little Chute Pulp Company building at Combined Locks, Wis., a 40-year-old brick structure, with a loss estimated at $25,000, reported to be covered by insurance.

The building is owned by the Green Bay and Mississippi Canal Company and was leased by the Combined Locks Paper Company which operated it as a pulp mill until about one and a half years ago. It has been leased since 1914, but was abandoned when the company ceased pulp manufacture and began buying commercial pulp.

About 750 tons of pulp stored in a frame addition was saved except for a loss estimated at about $500.

Workmen had been removing machinery from the old mill for the last two weeks to make room for additional pulp storage. They were tearing out pipe and other salvage metal, and it is believed the fire started from a blow torch. The oil soaked floor caused a quick spread of the flames, necessitating the combined efforts of fire departments from Combined Locks, Little Chute and Kimberly to bring the fire under control.

Kimberly-Clark Reports Fine Safety Record

Last week marked the completion of twenty-two years of operation in the laboratory and testing stations of the Kimberly-Clark Corporation's mill at Kimberly, Wis. without a lost-time accident. There are 24 employees in the department, and the last accident occurred February 7, 1918, when a chemist received acid burns. Considering that the work involves handling hazardous chemicals and explosives, and obtaining samples in hazardous surroundings, the record is considered an outstanding one. George R. Gerrits heads the department and Cornelius F. Crowe heads the testing station. The latter has served for nearly twenty-one years.

Petitions for Tax Abatement

HOLYOKE, Mass., February 14, 1940—Hearing on the petition of the Parsons Paper company of this city for a tax abatement from 1938 real estate taxes has been going on before Richard P. Stapleton of the State Tax Appellate board in Springfield. No findings have yet been made.

The municipality assessed the property for $428,100 of which $251,500 was placed on buildings. The tax bill in the year under petition was $13,725. The paper mill contends the fair cash value of the property was only $260,000. Some of the experts appearing for the company placed a value of $72,000 on the buildings.

Paper Men Attend Lumbermen's Convention

Operators In Pulp and Paper Industry Well Represented At Two-Day Convention of Canadian Lumbermen's Association Held In Montreal — Many Topics of Mutual Interest Discussed — A Lumber Camp Mystery.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., February 12, 1940—Operators in the pulp and paper industry were well represented at the two-day convention of the Canadian Lumbermen's Association just concluded in this city. Many topics of mutual interests were discussed, the lumber and pulp and paper industries being closely interlocked, as quite a number of companies produce all three products.

Particular interest centered in an address of J. B. Prince, of the Forest Production Laboratories, Ottawa, who advocated much greater attention to the manufacture of pulp from sawmill waste. He said that close to 40,000,000 cubic feet of spruce are wasted or destroyed each year in the sawmills of Quebec and the Maritime Provinces for lack of a suitable market. On the whole the quantity of spruce wood actually discarded as refuse amounts, he declared to 50 per cent of the volume of spruce lumber sawn in any given year.

E. S. Fellows, of the same department, in a companion report, suggested means whereby the material might be used to a much greater extent in the manufacture of pulp, claiming that this would be to the advantage of the woodworking industries as a whole and to the entire nation.

The president of the Association, S. J. Staniforth, thought the outlook good for the lumber industry, and referred particularly to the increased demands from the United Kingdom as a result of the war. The quantity of lumber shipped from Canada to the United Kingdom in 1939 was the largest ever shipped to that country, he said. This export figure totalled 1,188,000,000 feet and exceeded the previous year's figure by about 24 per cent. There was a decrease this December as compared to the corresponding figure for 1938, Mr. Staniforth said, but this was attributable to the lack of shipping space to carry ordered goods.

In 1939 the total exports of all lumber and timber from Canada was 2,212,569 M feet at a total value of $50,548,930, R. L. Sargant, of Ottawa, secretary-manager of the association, said in his report. In 1938 the total value of exports amounted to $37,000,000, he said. The value of exports to Great Britain alone in 1939 was $25,000,000.

John E. Sayre, of Saint John, N. B., was elected president for the ensuing year, and other officers elected were: James L. Crane, Thessalon, Ont., 1st vice-president; E. W. Ross, Edmundston, N. B., 2nd vice-president; R. G. Cameron, Ottawa, Ont., honorary treasurer; R. L. Sargant, Ottawa, Ont., secretary-manager.

Directors for 1940: J. J. McFadden, D. A. Gillies, A. Harper, S. J. Staniforth, E. W. Ross, R. E. Stocking and Farnham W. Smith.

Gordon Dale Heads E. B. Eddy Co.

At the annual meeting of the E. B. Eddy Company, of Ottawa, G. Gordon Dale of that city was elected president. He succeeds Victor M. Drury, president and director for over 11 years, who has resigned owing to pressure of other business. At the meeting the following directors were elected: Rt. Hon. R. B. Bennett, K.C., P.C., G. Gordon Gale, W. S. Kidd, John F. Taylor and Philip F. Foran.

Other officers elected were: John F. Taylor, vice-president; W. S. Kidd, general manager; R. P. Egerton, treasurer, and E. L. Milks, secretary.

A Lumber Camp Mystery Story

There have been strange doings in the Canadian International Paper Company's lumber camp at Rogers Lake in Northern Quebec, and "now it can be told" what has kept the husky, hardy, two-fisted lumberjacks there "all of a jitter" since last fall. Lumberjacks are a superstitious race. For instance, there's the bird called the whiskey jack, which so often perches on a branch to watch the lumberjacks at work.

They say though it looks like a bird it is really the spirit of some dead lumberjack that comes around for "company."

The story now to be told has to do with a bird, too, but not a whiskey jack. It was an invisible bird that came in the evenings and "attacked" the lumberjacks. Fancy having your hat snatched off your head by something you couldn't see or hear, and never seeing the hat again. There are 19 lumberjacks in the camp who have had their hats stolen that way. Fancy having your face scratched by an invisible foe, sometimes so deeply that you had to have it fixed up with sticking plaster. There are a number with such scratches in the camp today. Some of the men thought the devil was abroad; some declared they'd leave the haunted place. Things came to such a pass that at the request of the camp boss the Provincial Police sent two officers to investigate. They made the journey by dog sled 55 miles over the snow from Noranda. All they could do at first was to confirm the stories of the lumberjacks. But on February 8 word came back from the camp that the mystery had been solved. One of the constables caught the offender in an unbaited beaver trap. It was a screech owl, four pounds in weight, with a wing spread of four feet, eight inches, a height of 22 inches, and talons as sharp as needles. No fewer than 40 woodsmen had been attacked by this bird, the police declare.

Move Purchasing Offices to Delair

The Cherry River Paper Company with mills at Richwood, W. Va., and offices in the Pennsylvania Building, Philadelphia, Pa., has moved its purchasing department to the offices of the Kieckhefer Container Company at Delair, N. J. All matters pertaining to the sale of products to the Cherry River Paper Company should be referred to H. R. Guldin, purchasing agent.

Chicago Market Reports Buyers Cautious

Midwest Paper Trade Continues To Show Little Activity With Buyers Cautious In Placing Future Orders—Current Lull Held To Be Temporary — Kraft Paper In Fair Demand — Waste Paper Market Is Rather Soft.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., February 12, 1940—The Chicago paper market continued to show little activity during the past week. Buyers were reported to be showing caution in making immediate commitments though long term action was apparently the underlying strength of the market itself. Paper executives here reported their belief that the present inactivity was only temporary and that some reports of uncertainty in various markets were only due to the "marking time" procedure of some mills.

Waste papers continued to be easy locally with the supply plentiful. Reports showed a concentration in the higher grades with resultant weaknesses in the lower grades of waste. Groundwoods were virtually unchanged during the week and newsprints reacted to the slight slowing up in business. Sulphite bonds were comparatively slow and unchanged. The general bond and ledger line was colorless according to local observers. Krafts were in fair demand though retail outlets reported a slackening of over-the-counter transactions for the first week in February.

Plan to Attend NPTA Meetings

Chicago will have its usual excellent representation at the annual meeting of the National Paper Trade Association to be held in New York City February 19-22. Not only will many executives be on hand to take care of the exhibits which will feature the convention but a great many will attend the Paper & Twine Club meetings, the Salesmens Association luncheon and election of officers on February 20 and the general sessions of the NPTA. While no special Pullman cars have been arranged for, sales and production executives expect to depart on trains leaving Chicago on Sunday, February 18, though many will leave at an even earlier date.

Berkshire Adds New Lines

The Berkshire Papers, Inc., organization, Chicago, has added several new items during the past few weeks including Mount Vernon Text plain edge envelopes and Cornell Index. The latter item is described as a new grade of fourdrinier bristol made in white only. This information was contained in the price list mailings which indicate advance in many envelope grades and some decline in certain blottings and tympan papers.

Credit Men Discuss Foreign Trade

The foreign trade division of the Chicago Association of Credit Men, an organization in which many paper trade executives are interested, will hold a regular luncheon on February 15 at the Hotel Sherman at which time a round table discussion will be utilized to bring out many phases of exchange restrictions, import quotas, collection delays and general credit experience and information. This round table discussion will cover every market in which Chicago exporters have a pertinent interest. The major countries scheduled for discussion are Argentina, Bolivia, Colombia, Chile, Ecuador, Egypt, Greece, Norway, Portugal and Sweden.

S. D. Warren Moves Office

The Chicago offices of the S. D. Warren Company have been moved to the Civic Opera Building at 20 North Wacker drive. Space on the 34th floor has been taken with George Olmsted, Jr., continuing as manager of the Chicago headquarters.

Labor Board Orders Secret Election

The Acme Paper Box Company, Inc., 2427 14th street, has been directed by the National Labor Relations Board to conduct a secret election among employees during the next month, according to local news reports. The employees will vote to decide whether they want to be represented for collective bargaining purposes by the International Printing Pressmen and Assistants union, an affiliate of the American Federation of Labor, or by no union, according to local accounts.

J. F. Blackman Elected President

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 12, 1940—John F. Blackman, of D. F. Munroe Company, was elected president of the New England Paper Merchants Association at the annual meeting held Wednesday evening at the Parker House. Other officers elected were Frederick G. Lockwood, first vice-president in charge of the Fine Paper Division; Gilbert T. Singleton, second vice-president in charge of the Wrapping Paper Division; Frank B. Cummings, treasurer; William H. Walpole, acting secretary. Directors, John H. Brewer, Charles A. Esty, Leon M. Poore, Harry J. Dowd, Samuel L. Ginsburg, Robert M. Stone, James C. Campbell, representing Rhode Island and Southern Massachusetts; Sterling R. Chatfield, Connecticut; John R. Whitney, Western Massachusetts; Harold R. Robinson, Maine, New Hampshire and Vermont.

The meeting was opened by the retiring president, John H. Brewer, with 31 attending.

Rev. Lex King Souter, of Fall River, Mass., in his address, told members not to begin the day with a pet peeve on their minds if they wanted to make a success of business and life. Speaking for greater morality and character, he admonished his hearers not to gripe at the government and business conditions but to ask themselves if they are not in some way responsible for some of the ills of the world. Moral decay, he affirmed, has attacked the economic structure. He urged that a code of ethics be rigidly adhered to by all.

Robert H. Ziegler, assistant secretary, Wrapping Paper Division, National Paper Trade Association of the United States, gave an inspirational talk.

Philadelphia Paper Men Hold Meetings

Wrapping Paper Division of the Paper Trade Association of Philadelphia Hear Talk By Robert Ziegler — Paper and Cordage Association Holds Regular Monthly Luncheon Meeting—Waste Merchants Attend Banquet.

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, PA., February 12, 1940—The Wrapping Paper Division of the Paper Trade Association of Philadelphia, at their recent luncheon meeting in Schwoyer's Restaurant, had as guest speaker Robert Ziegler, secretary of the Wrapping Paper Division of the National Paper Trade Association. Mr. Ziegler gave some interesting highlights on a plan for proper merchandising and at the same time making some money. The plan, he said, would be fully discussed on February 19th at the national convention in the Waldorf Astoria.

LeRoy Bishop, Raymond & McNutt Paper Company, and vice-president in charge of the fine paper division, and W. B. Killhour, Jr., president of Quaker City Paper Company, and vice-president in charge of the wrapping paper division, will represent the Philadelphia Paper Trade Association at the National Convention in New York. Nathaniel Saxe, president of the Association will attend the sessions of the convention scheduled for February 19th.

Paper and Cordage Association Meets

The Philadelphia Paper and Cordage Association will have O. Howard Wolfe, vice-president and cashier of the Philadelphia National Bank, as speaker at their regular monthly luncheon meeting in the Arcadia on February 16th. Mr. Wolfe will talk on "Lessons Learned by Business in the Last War That May Apply in this War." He is a keen student of international affairs and as an officer of one of the oldest and largest banks in the United States is in a position to have first hand knowledge of some interesting facts on this subject.

Frank Kurz, Whiting-Patterson Company, who is secretary of the Association, says: "Those of us who remember the chaos in the paper business during and immediately after the last war and the scramble during August, 1939, should make it a point to see that the officers who have charge of making up the budget and the sales managers of their respective companies attend this meeting for Mr. Wolfe will present some thought provoking topics to all those who are interested in the management of a standard business."

The applications of the following for membership in the Association will be voted on at this meeting: Gallen Paper Company, 739-743 N. 24th street; Molten Paper Company, 25 S. 6th street; Independent Twine and Yarn Company, Inc., 9 N. 5th street and The Thomas W. Price Company, 14-16 S. 5th street.

Butler Smythe Heads a "New" Committee

Butler Smythe, president of J. L. N. Smythe Company, has been appointed chairman of a committee that so far as is known is a "first" in the annals of paper trade association activities. The Philadelphia Paper and Cordage Association, by way of innovation, has included in its schedule for the outings during the coming year one on May 15th at the Philadelphia Cricket Club's Flourtown Course, a golf tournament that only officers, such as presidents, vice-presidents, and treasurers of paper mills and paper houses will be eligible to participate. As a climax to the occasion W. C. Hamilton & Sons, Miquon, Pa., have donated a very handsome silver cup to be known as "The Presidents' Cup," which will be awarded the winner.

Waste Merchants Association Hold Banquet

The Philadelphia Waste Merchants Association held its 35th annual banquet on Friday last in the Crystal Ballroom of the Benjamin Franklin Hotel with 310 mill officials and representatives in attendance. President Harry M. Bailey highly commended the banquet committee comprising Arthur L. Feierman, chairman, Joseph F. O'Neill, Maurice Mossman, George H. French and William T. McNamee, for the splendid work they had done in making this the most outstanding banquet the Association has ever held.

Moore & White Making More Dryers

Moore & White Company report the trend in equipment for paper mills very much stimulated. Among numerous other orders, this company is making additional dryers for paper machines at the Standard Paper Manufacturing Company, Richmond, Va.

Sylvester Garrett, Jr. with Labor Board

Sylvester S. Garrett, Jr., who, during his vacation from college, worked in his father's paper house, and is well known to all those in the paper trade, has received an appointment in the Legal Department of the National Labor Relations Board at Washington.

Conditions in the waste paper industry are rather quiet. Over-issues, however, are maintained at a very high level. Most available supplies, it is said, are being gathered up in New York and shipped to the Far East at high export prices, where they are being used as wrapping paper.

Expands Education Department

Bermingham & Prosser, a company that has been very progressive in building lines of school paper to fit contemporary education needs, announces the establishing of an Eastern Educational Department at its New York offices, 10 East 40th street, on March 1. Miss Katherine Schenk who has many friends in the school field and who has been associated with Bermingham & Prosser in Chicago for two years will head this department. Miss Schenk is well acquainted in the East having been with the New York branch of the American Crayon Company for eleven years. The company will continue the policy of distributing its attractive papers through regularly established school supply houses.

Pacific TAPPI Meets at Everett, Wash.

The Pacific Section of the Technical Association of the Pulp and Paper Industry met at Everett, Wash. on Tuesday, February 6th, 1940. N. W. Coster of the Soundview Pulp Company presided as chairman. Announcement was made that the national summer meeting of the Technical Association would be held at the Olympic Hotel, Seattle, Wash. on August 20-23, 1940 and all members of the Section were urged to give their whole hearted support to make the meeting a success.

Alcoholysis of Wood

A. J. Bailey, acting director of Lignin and Cellulose Research at the University of Washington spoke on the Alcoholysis of Wood. This paper dealt with the experiments that have been conducted on the digestion of wood with alcohols of one to seven carbon atoms. Butyl alcohol was indicated as the most suitable from the standpoint of lignin removal. Dr. Bailey expressed the hope that the experiments might be carried on to the pilot plant stage. He ventured to say that there was a possibility that wood chips might be digested with butyl alcohol, the residues recovered and fermented by selective bacteria, and the sugars reconverted to butyl alcohol, thereby making a complete cycle of the digestion solvents.

Cleaning Paper Mill Equipment

The next speaker was W. C. Tyson, vice president of the Hydro Silica Corporation, Gasport, N. Y. who talked about the use of high pressure water and air jets for the removal of scale in pulp mill equipment such as pipe lines, screens, suction boxes, couch rolls, etc.

The cleaning unit consists of a high pressure pump capable of developing at least 1000 pounds pressure. This is usually driven by a 15 h.p. motor. It is equipped with hose and couplings and nozzles to handle these high pressures. About sixty mills have installed this equipment during the past year and have reported a considerable saving in time and money for clean-up operations.

A flat spray gun is used for cleaning head boxes, flat screen boxes and stock chests. This gun throws a flat fan-shaped spray instead of the narrow spray of the hydro air-gun. It can also be used for cleaning couch rolls with the wire in place. It is also helpful for removing pitch or rosin spots from the wire. Pipes ranging from 1½ to 15 inches in diameter have been successfully cleaned.

Those in Attendance

Among those present were the following:

Jerry Alcorn, A. J. Bailey, C. M. Barr, C. B. Baxter, Chas H. Belvin, H. K. Benson, H. K. Berger, Leo S. Burdon, G. H. Cady, John M. Carlson, E. Christoferson, Sidney M. Collier, N. W. Coster, A. E. Duke, Erik Ekholm, A. W. Erickson, Harold R. Erickson, E. O. Ericsson, O. E. Fox, A. S. Gerry, D. V. Hamilton, D. W. Harris, S. H Harrison, L. R. Hartman, A. D. Hawley, L. E. Hill, Jr., Walter S. Hodges, Clyde F. Holcomb, A. H. Hooker, Jr., R. M. Inkster, W. A. Kelly, B. L. Kerns, Frank G. Keuss, Robert M. Kuhn, Charles C. Lawrence, Nels G. Lindh, G. H. McGregor, H. L. Marshall, Jack Martin, Fred Nicholson, C. B. Niel, E. A. Norton, F. A. Olmsted, W. H. Osborne, Frederic M. Pape, Carl A. Ramstad, Carl Ries, Oliver E. Ronken, S. A. Salmonson, Walter A. Salmonson, Harlan Scott, J. M. Shedd, Brian Shera, Paul R. Smith, Henry Solbakken, P. E. Sullivan, H. V. Tartar, R. I. Thieme, W. C. Tyson, R. O. Vognild, Edw. A. Vohs, W. A. Watson, L. A. Wendt, A. F. Winklesky.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 14, 1940—Mudge Paper Company has been awarded the contract for furnishing the Government Printing Office with 175,500 pounds (500,000 sheets) of 50 per cent rag, 38 x 48 white ledger paper at 8.549 cents, bids for which were received on January 29.

R. P. Andrews Paper Company will furnish 211,825 pounds (925,000 sheets) of 50 per cent rag, 38 x 47 buff ledger paper at 8.68 cents, bids for which were received on January 24.

Paper Corporation of U. S., will furnish 13,000 pounds (100,000 sheets) of 50 per cent rag, 20 x 25 blue antique cover paper at 9.14 cents and Mudge Paper Company will furnish 17,000 sheets of 20 x 25 blue gummed paper at $8.89 per M sheets. Bids for these items were received on January 19.

R. P. Andrews Paper Company will furnish 19,000 pounds (100,000 sheets) of 27 x 38 chemical wood manila paper at 5.5 cents, bids for which were received on January 17.

The same firm will also furnish 5,000 pounds of oiled manila tympan paper in 38 inch rolls at 7.45 cents, bids for which were received on January 15.

The Printing Office has received the following bids for 10,000 pounds of No. 1 gummed kraft paper; Resolute Paper Products Corp., 8.125 cents less 2 per cent; Enterprise Paper Company, 8.58 cents less 2 per cent; R. P. Andrews Paper Company, 10.04 cents; Whitaker Paper Company, 9.75 cents; Mathers-Lamm Paper Company, 8.12 cents; Andrews Paper House of York, 9.75 cents; Cauthorne Paper Company, 9.73 cents; Stanford Paper Company, 8.75 cents; and Barton, Duer & Koch Paper Company, 9.75 cents.

A New Morris Stock Pump

A new bulletin describing a centrifugal pump which is guaranteed to be non-binding when handling thick pulpy materials such as heavy paper machine stock or raw waste paper stock, has just been published by Morris Machine Works, who have been building pumps for pulp and paper mill service for over 75 years.

The bulletin explains the distinctive features of the pump which prevent choking, air-binding and vibration, and provide constant delivery at varying heads. The illustrations include an opened-up view of the pump and a sectional drawing on which the advantageous elements of design are pointed out. Copies of the bulletin can be obtained by addressing Morris Machine Works, Baldwinsville, N. Y., and asking for Bulletin 176 on the ST-P Stock Pump.

Recent Developments on Paper Making Cylinder Vat Construction

By J. W. Joslyn[1]

The cylinder machine is used extensively to cover a wide field of paper making requirements from the lightest to the heaviest grades, including many specialties. For cylinder machine production the greatest variety of furnishes can be used from ground wood to specification pulps; street rags to linen fibers; and miscellaneous items such as jute, hemp, straw, sugar cane, leather, asbestos, and waste papers.

As there are many types of paper from many furnishes, there are also many kinds of cylinder machines. A one mould machine may be making high grade hydrated rag paper in one mill or very free rag felt in another. In other mills will be found cylinder machines with from two to eight moulds per machine often making competing grades with entirely different equipment. In spite of these wide variations, there are certain problems, or difficulties, which are common to them all. Recent developments and improvements to help overcome these problems are now available to the cylinder machine operator.

As machines have increased in size and speed, the demand for perfection in the finished sheet of paper has become increasingly important. We shall speak first of what is considered by most paper makers as the outstanding requirement to produce that needed perfection in the finished sheet of paper.

Distribution

Ever since paper has been made by machine, whether cylinder machine or fourdrinier, paper makers have considered methods of distribution of stock across the forming point of the machine as the most important problem of paper making. To attempt to describe the many methods tried and used would be an impossible task. However, a method of distribution known as the "Sandy Hill Bertrams Flow Distributor" has been devised which gives to the paper industry what the manifold gave the automobile industry when, with the event of multiple cylinders, the need of good distribution of gases became a genuine problem. With the automobile, gases are uniformly spread regardless of the make, type or number of cylinders used. Likewise, the "Sandy Hill Bertrams Flow Distributor" is designed as a multiple manifold which will deliver a uniform consistency the full width of the machine, regardless of changes such as weight, consistency, speed, freeness, or grade of stock.

The design of the Distributor is such that it takes up very little room, in most cases considerably less space than the old conventional type of head box. It is designed for the requirements of each machine after a study has been made of the grades, speeds and other varying conditions. The stock, leaving the screen, is generally considered one of the most uniform paper stock mixtures in the mill. Spreading this mixture evenly across the forming point of the machine just as soon as possible is one of the advantages of the "Sandy Hill Bertrams Flow Distributor," thus eliminating the chance of flocking or channeling.

[1] Engineer, Sandy Hill Iron and Brass Works, Hudson Falls, N. Y.

Variety

Probably the second outstanding problem in the paper mill today is caused by the necessity of making a wide range of types and grades of paper on the same machine. In this day of specialties and specifications, few are the machines which are blessed with long runs on a limited number of grades. Thus it befalls the cylinder machine operator to produce results under conditions which, if correct in one case, must be wrong in the other providing the most is to be obtained from a given furnish.

In cylinder machine operation, the majority of paper makers will agree on certain outstanding principles but the method of producing these results has varied widely since there are so many types of paper to be made on the same machine. However, this condition is now altered by the fact that cylinder paper machines are available, whereby compensation for these variables can be made when running.

The "Sandy Hill Adjustable Flow Vat" equipped with the "Sandy Hill Bertrams Flow Distributor" gives first a uniform distribution to the forming point at all times. Secondly, when changes of grades or weights are necessary, adjustments can be made while running, to increase or decrease the space between the cylinder mould and the vat circle. This adjustment can be effected in the horizontal as well as in the vertical direction which not only compensates for freeness or weight changes but also provides a means of changing the grain of the paper. By a simple mechanical method the vat and mould can be re-set at a point to give the best characteristics for a given furnish. The speed and volume of the stock in the circle are readily altered; likewise, good regulation on the white water inside the mould is obtained.

At this point we are reminded of a third difficulty, which has caused many a paper maker's headache in the past.

The Making Board

The so-called making board or slice on the cylinder machine is used to produce a more level sheet. Its function is twofold: first, to attempt to correct uneven flows and mixtures, and second, to compensate for a condition, found on all cylinder types of machines, caused by the tendency of the cylinder mould to form stock at a different rate at the center of the mould than at the edges. So, even with good distribution to the cylinder mould, the making or leveling board still has a function.

A new type device known as the "Sandy Hill Combination Slice and Making Board" not only serves in this capacity but also makes it possible to alter certain other characteristics of the sheet by simple adjustment of position. The combination slice and making board is introduced at a location between the

cylinder mould and the point where the stock enters the circle of the vat. The mechanism is V shaped and hinged at the bottom, thereby forming two wings which are adjustable as a unit in the vertical as well as in the horizontal directions. In addition, each wing can be adjusted within certain angles from the vertical and different pitches can be produced at the center of each wing from that of the edges.

It has been found that by altering the position of the wings of this slice and making board, a combination of direct flow and contra-flow formation is obtained at the same time, which will affect certain characteristics of the sheet such as density, absorption and general formation.

The cylinder machine operator's vat problems in the past have been partly limitation of space and partly lack of flexibility in the vat. Now the "Sandy Hill Bertrams Flow Distributor" gives him superior distribution. The "Sandy Hill Adjustable Flow Vat" permits ready control of flow with a simple adjustment. The combined slice and making board gives him additional control and change in general characteristics at the sheet. Well engineered but simple, these three patented devices built into a Sandy Hill vat supply the essential flexible adjustments on a cylinder machine vat.

Indianapolis Looks To Spring Demand

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., February 12, 1940—Little change was seen last week in paper demand, but most of the jobbers in this territory feel there is little real cause for worry. Most buying continues to be done on a hand to mouth basis but inquiries are frequent and indicate that spring will show a fair volume. Prices in all lines are being firmly held and there has been no indication of softening.

The particular dull spot in the market just now is in building and roofing papers. Due partly to adverse weather conditions, the building business got off the new year to a bad start. There are several now who believe this year will not be as good a building year as last. Building permits in all the larger cities of the state fell far down during January. Here in Indianapolis permits were only 20 per cent as compared with January of last year. Retailers are buying only for immediate needs and have become very cautious, seeking to more nearly gauge the possible trend for early spring.

Demand for quality paper continues to hold steady. Prices are firm and the trade generally is looking for a good spring business. A slight improvement has been seen in container and box demand due to the break in weather. Local factories now are able to make deliveries on time and executives are predicting a nice spring business. Production is being stepped up gradually and preparations are being made for the seasonal spring and summer business that is expected to start shortly. Thus far there has been little advance call for summer specialties, but some inquiries have been received. Several of the local houses have some attractive deals ready to start the new season.

The paper stock market held firm the last week but mill demand is not all that might be desired. Better grade paper appeared slightly stronger than the week before, but other grades were unchanged. Mill buying in the rag market was light, but prices ruled firm with better grades apparently most wanted.

New Fluid Impact Mill

The Asbury Research Developments, originators of rotary process equipment, with headquarters at Wyncote, Pa., are offering a very new type of mill applicable to the disintegrative treatment of all types of fluid mixtures.

The Asbury Fluid Impact Mill now presented to industry for the first time, is the culmination of years of research on the part of Charles T. Asbury, mechanical engineer, advised and assisted in more recent times by J. Cecil Rhodes, M. S., chemical engineer and chemist. It is designed to act upon fluids by utilizing specially designed rotors to produce impact by means of centrifugal force. These rotors, operated in successive stages, divide the liquid materials into the form of a fine mist, the particles of which are driven by centrifugal action at tremendous velocity against impact rings designed to direct the fluid film so formed into the periphery of the succeeding rotor.

Because of the fact that no part of a rotor comes in contact with a stator, there can be no grinding type of action whatever. In consequence, all mechanical energy is utilized in disintegrating material and not in the production of heat. No mixture has yet been processed in these mills which showed a temperature rise of more than two degrees Centigrade during passage, even though no cooling mechanism was utilized.

Because of the lack of frictional contact as mentioned above, no adjustments are necessary, and dimensional changes due to low or high temperatures have no effect on the operation of the mill. In consequence, it can be operated at any temperature at which fluid treatment may be desired, ranging from that of liquid air to that of boiling mineral oil without any adjustment or fear of damage to the equipment.

The applications of this new piece of equipment are so manifold as almost to defy enumeration. Emulsions of mineral and vegetable oils as well as those of animal and marine origin are made or improved with ease. Multiple admission ports admit of feeding several materials simultaneously, thus permitting the production of a finished emulsion in one continuous process. Asphalt emulsion production is expected to be improved materially by applying this principle.

The multiple port feature also lends itself beautifully to the continuous production of uniform and finely divided pigments, organic and inorganic. Coupling of diazo compounds can be carried out continuously under rigidly controlled and unvarying conditions, assuring the formation of lithopone and the various lead pigments needs no elaboration.

The dispersion of pigments, clays and fillers can be carried out most successfully in the Fluid Impact Mill with small power consumption and high output.

The use of the Asbury mill need not be limited to thin fluid mixes. Any material which will flow or can be pumped into the mill is a potential subject.

The Ortho-Chrome Process

EDITOR OF THE PAPER TRADE JOURNAL:

A colleague of mine, Dr. V. G. W. Harrison head of our paper section has read the paper by Albert B. Hurley (PAPER TRADE J. 109 (16) 37), and feels that it calls for some comment. He has asked me to forward his comments in the hope that you will be able to publish them. Dr. Harrison feels, and I agree with him, that some of the statements made by the author are open to question.

G. L. RIDDELL, Director of Research.

A recent Paper published in the Technical Association Section of the PAPER TRADE JOURNAL gave "a description of a coating process utilizing the printing principle to reduce glare from the paper surface." While it is not denied that the process may give pleasing results, the paper in question contains so much that is inaccurate or misleading that a detailed reply to it is necessary.

ALLEGED DETERIORATION OF EYESIGHT

In his first paragraph, the author of the Paper claims that "Accepted as fact, is the knowledge that our eyesight has deteriorated rapidly since the advent of the electric or artificial light." By whom this statement is accepted as fact is not mentioned. It is also stated that "artificial lights with a preponderance of yellow and red rays, cause eyestrain and fatigue, are harmful to the eye and impair vision."

I am unaware of any published work giving definite evidence that the use of artificial light produces eyestrain or deterioration of eyesight. In addition, I have consulted the National Physical Laboratory, the Royal Ophthalmic Hospital and the Medical Research Council. These bodies are agreed that there is no scientific evidence in favor of the view that artificial light is harmful to the eyes. I quote the Physiologist at the Royal London Ophthalmic Hospital:

"There would appear to be nothing in the suggestion that yellow (or any other colored light) is conducive to eye strain. The most conclusive evidence is that scientific workers may be exposed all day to monochromatic yellow or other light, and suffer no ill effects. Since the results are uniformly negative nothing has appeared in the serious literature on the subject.

"There was a movement recently in France to prove the opposite, namely that yellow light was the best for visual acuity and general comfort. These claims could not be substantiated and there was a report on the subject issued by the Illumination Committee of the Department of Scientific and Industrial Research.

"There was also a report by a Committee of the British Medical Association on the use of yellow motor car headlamps a few years ago. The conclusion was that colored light makes no difference one way or the other."

It seems to me that the only satisfactory way of finding whether or not a general deterioration of eyesight has occurred in recent years is to make a statistical survey, extending over many years, of the nature and extent of defects of vision existing among all sections of the community. Such a survey has not, to my knowledge, been made in a sufficiently complete form, as the records of past years are imperfect. Even if it were thus proved that our eyesight is worse than that of our ancestors, it would still remain to be shown that the deterioration could be attributed to the use of artificial light, and, in particular, to its color and not to its bad distribution. To prove this would be extremely difficult and would necessitate most careful analysis of the available data, since there are many other factors conducive to eyestrain besides the nature of the lighting. As far as I am aware, the excess of red in artificial light is unobjectionable, except from the point of view of color rendering. The defects of most installations of electric lighting arise not from the quality or quantity of light emitted, but from its uneven distribution and from the presence of unscreened sources of small area and of much greater brightness than their surroundings. It must also be remembered that the illuminants in use before the introduction of incandescent gas and electric light (for example, candles, oil and gas jets) were very yellow in color—worse in this respect than modern illuminants—and that daylight itself can vary considerably in color throughout the day.

GLARE

To make a further quotation from the paper referred to: "High intensities of even two or three thousand foot candle brightness of a daylight character cause only normal reaction of the pupil of the eye, while low intensities of artificial illuminants with their preponderant red and yellow rays cause glare and pupillary contraction that should and can be controlled." A low intensity causes the pupil to dilate and not to contract. The author does not state precisely what he means by "glare," but the term is usually taken to mean the disturbing effect of a small region of a field of view of much greater brightness than the rest. Glare in this sense is much more troublesome with artificial light than with daylight, particularly when unscreened clear glass electric lamps are used; but the glare is due to the bad distribution of the light and not to its yellow color. I am aware of no adequate evidence to show that electric light produces more glare than daylight of the same intensity and distribution.

In the same paragraph I would point out that the brightness of the retinal image is approximately proportional to the *area* of the pupillary opening and not to its diameter, as stated.

PHYSICAL AND OPTICAL ASPECTS OF PAPER

In this section it is stated that "By means of a spectrophotometer white papers and surfaces can be compared with magnesium which is supposed to reflect blue-green and red in quantities to give the sensation of pure white." The standard white used for spectrophotometric measurements is magnesium oxide or magnesium carbonate, and not magnesium. Magnesium metal as a standard of reflectance would be unsatisfactory in the extreme. The error does not appear to be due to a misprint, for it is repeated later. The author then goes on to state: "Reading ordinarily involves the recognition of groups of characters as well as it does the discrimination of fine detail. The printed character is usually in black which is supposed to absorb all of the light or in a color giving such

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contrast that it has a low reflection factor. White papers of good quality finish coated or machined, having a reflection factor of 80 to 85 per cent, show too great a contrast with the character thereon. The pupil tends to contract under the brightness of the white surface but by a fatiguing muscular action adapts its adjustment with that of the lens to give the retina an image requiring fine definition." What this last sentence is intended to mean is not clear. Neither is the general argument clear to me. Does the author mean that a degree of contrast between paper and print satisfactory in daylight becomes excessive in artificial light, or does he mean that the contrast is excessive under all conditions? Taking the article as a whole, I am inclined to think he means the former, in which case I would point out that the contrast between paper and printed matter for normal near-white papers varies but little for different sources of illumination. For example, the brightness, compared with magnesium oxide, of a cream-white paper recently examined in these laboratories was 79.6 per cent in I. C. I. Illuminant A (tungsten light) and 78.5 per cent in the much bluer I. C. I. Illuminant C (north sky light). Even in the extreme case of monochromatic orange-yellow sodium light the brightness was only 81.6 per cent. Assuming a reflection factor of 5 per cent for black print, and also that this does not change appreciably with the illuminant, the contrast between paper and print will be as follows:—

93.72 per cent with tungsten light
93.63 per cent with north sky light
93.87 per cent with monochromatic sodium light

$$\left(\text{Contrast} = \frac{p_1 - p_2}{p_1}\right)$$

Thus the difference of brightness contrast is negligible. The contrast in tungsten light is reduced by less than 0.1 per cent if north sky light is substituted. On the other hand, if the author means that the contrast is excessive under all conditions of illumination, I would remind him that the effect of "glare" from a sheet of paper depends not only upon the reflectance of the sheet, but also upon the intensity of light falling upon it. Indeed, a close study of this paragraph seems to show that he is really thinking, not of the effects of contrast, but of excessive illumination, such as occur when one is reading in direct sunlight. If the paper appears too bright for comfort, surely the remedy is to reduce the intensity of illumination rather than to alter its color, or to reduce the reflectance of the paper. The whole passage is obscure and two or more distinct ideas appear to have been confused.

Method and Means of Application

In this section, the author explains the reason for applying the coating in the form of "small squares forming a checkerboard pattern, all points touching." One can but guess at the intended meaning of "The uniformity arranged pigment squares and the dimension of spacing would subtend to the eye a visual angle." Some remarkable claims are advanced for applying the coating in the half-tone pattern:

3. "Gives a natural and desirable diffusion of all light rays." I do not understand what kind of "diffusion" is meant, or how the coating is supposed to produce it.

4. "Allows the use of a less diluted color mix which gives more efficiency in the absorption and reflection of color waves." This, again, is obscure, but it may be intended to mean that it is easier to obtain a light tone by the use of a half-tone pattern than by continuous film. This may be true, but I fail to see how a deeper shade of blue printed as a half-tone can be more "efficient" than a lighter one printed solid, if the two appear of the same color to the eye when the work is finished.

5. "Acts as a grating in the diffraction of light from the two surfaces which increases the opacity." How the coating can be said to act as a diffraction grating and how the diffraction can increase the opacity of the paper is left unexplained. Diffraction effects do not ocur with diffused light, and the spacing of the elements of the coating is about fifty times that of a normal diffraction grating. Any increase in opacity which may be produced is probably due to the reduction in reflectance of the paper produced by application of the coating.

The Color Filter

In the section on the "color filter" there are several technical errors. In the discussion of Fig. 2 the author appears to have confused the ideas of luminosity of monochromatic radiation and dominant wavelength. In Fig. 2 of his paper he has compared the luminosity curve of the I. C. I. standard observer with the energy distribution curve for tungsten filament light. Secondly, though infra-red and ultra-violet may be detrimental to the eye, they are present in sunlight and are by no means peculiar to sources of artificial light. It is doubtful whether the coating will have any marked effect on the amount of infra-red radiation reflected from the paper, since most pigments reflect these rays freely. Thirdly, the limits of wavelength of visible radiation are much narrower than those given. Radiation of wavelength of less than 0.40μ is certainly not "easily visible." I have never heard of a case of an eye responsive to radiation of wavelength 1.0μ. Radiation of wavelength from 0.70μ to 0.76μ is visible, but plays little part in ordinary vision, and the practically useful limits of the visible spectrum may be set at from 0.40μ to 0.70μ. Fourthly, the Purkinje effect, mentioned on page 40, occurs only at low intensities, below those normally employed for reading in artificial light.

Visual Results

In this section one finds it stated that "Under daylight the advantage of the treated surface lines in the reflection (reduction?) of glare and the lowering of the reflection factor to secure better contrast of background and character thereon." It would be interesting to learn how reducing the reflectance of the paper gives "better" contrast with the printed matter. Does the author mean by "better", lower contrast? Finally, may I ask what precisely is meant by the paragraph: "Light reflected from the treated surface will normally and evenly stimulate the rod and cone cells by a predetermined period of vibration which will result in a normal reaction of nerves without strain. It will prevent the over-stimulation of the retina which causes the sensation of 'over-shoot'; lessen the effect of after images and the possibility of mistaking a printed character, letter or figure. Because of the percentage difference in stimulation of the retina the growth and decay of color sensations is helped, which saves a period between the time of first perception and that of final conception." Can cells be stimulated by "a predetermined period of vibration," and how is the period "predetermined"? And how is a period betwen the time of first perception and that of final conception "saved"?

I would make it clear that I am not criticizing the

process—I am criticizing the paper describing it. It appears that the real object of the process is to give a sheet of paper a bluish tint which tends to neutralize the yellowish color of artificial light.

V. G. W. HARRISON.

The Printing & Allied Trades Research Association,
Patra House, 10 Robin Hood Court,
Shoe Lane, London, E. C. 4.

New TAPPI Members

The Executive Committee of the Technical Association of the Pulp and Paper Industry has elected the following to membership:

Carl L. Anderson, Cloquet, Minn., graduate (1939) of New York State College of Forestry who was formerly employed by the Fort Wayne Corrugated Paper Company, Vincennes, Ind.

Thomas E. Brookover, chemist, Downingtown Paper Company, Downingtown, Pa., graduate (1937) Lehigh University and formerly engineer for the Honolulu Iron Works Company, New York, N. Y.

David C. Greeley, chart room assistant, Technical Staff, Weyerhaeuser Timber Company, Pulp Division, Longview, Wash., graduate (1939) University of Washington and formerly employed by the Pacific States Lumber Company, Selleck, Wash.

William R. Grunow, Special Representative, Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., graduate (1914) Columbia University School of Mines.

John H. Heuer, operating department, Oxford Paper Company, Rumford, Maine, attended the University of Washington and was formerly employed by the Weyerhaeuser Timber Company, Pulp Division and the Longview Fibre Company, Longview, Washington.

Gustav E. Mangsen, research chemist, Fitchburg Paper Company, Fitchburg, Mass., graduate (1931) Worcester Polytechnic Institute and (1932) Massachusetts Institute of Technology.

Gustave S. Mathey, vice president in charge of research and development, Johnson & Johnson, New Brunswick, N. J., graduate (1903) Columbia University College of Pharmacy and (1910) Cooper Union, formerly chief chemist, Van Horn & Sawtell.

John D. Moore, manufacturing department, Kimberly-Clark Corporation, Niagara Falls, N. Y., graduate (1936) New York State College of Forestry.

Donald H. Newcomb, chemist, Riegel Paper Corporation, Riegelsville, N. J., graduate (1937) Pennsylvania State College, formerly chemist for E. I. du Pont de Nemours, Carnies Point, N. J.

John O. Parrott, Bleach Room Foreman, Champion Paper and Fibre Company, Pasadena, Texas, graduate (1936) College of Charleston.

Ulric A. Shane, Mill Chemist, Price Brothers & Co., Ltd., Jonquiere, P. Q., graduate (1937) Queens University, formerly chemist for J. R. Booth, Ltd., Ottawa, Ont.

Earl A. Schilt, chemical engineer, Northwest Paper Company, Cloquet, Minn., graduate (1937) University of Minnesota, formerly chemist for General Mills, Inc.

William R. Turner, Jr., coordinating inspector, Champion Paper and Fibre Company, Hamilton, Ohio, attended Virginia Military Institute.

William J. Van Akin, Asst. general manufacturing manager, the Flintkote Company, East Rutherford, N. J., graduate (1924) Rensselaer Polytechnic Institute.

Louis Vassar, Holyoke, Mass., formerly owner of the Vassar Paper Company, Putney, Vermont, general superintendent, Monadnoch Paper Mills, Bennington, N. H., foreman, Keith Paper Company, Turners Falls, Mass. and helper, Esleek Paper Company, Turners Falls, Mass.

Arthur L. Whiteside, eastern representative, Hill Clutch Machine and Foundry Company, New York, N. Y., attended Ohio State University, formerly chief engineer, Pulp Bleaching Corporation, Orange, N. J.

Charles Wilson, student, University of Maine (1940) formerly laboratory assistant, R. T. Vanderbilt Company, E. Norwalk, Conn.

May Make Paper Out of Meadow Grass

Salt hay and meadow grass growing in areas near Wildwood and other South Jersey resorts may be made into paper, according to the *Evening News* of Newark, N. J.

Mayor Krogman of Wildwood said that 25 pounds of salt hay sent to Dr. R. W. Hochstetter, Pittsburgh chemist, had been made into paper, it is said.

Revelation that the hay could be used to make paper pulp described as equal in grade to paper pulp imported from Sweden at $60 a ton, has prompted Governor Moore to call a conference the latter part of the month with Dr. Hochstetter and Wildwood officials.

Mayor Krogman said Dr. Hochstetter told him that if a pulp-making plant can be located near Wildwood, the hay and meadow grass might be combined with discarded paper gathered in refuse collections to produce commercial paper products. The mayor added that steps are under way to "interest a paper pulp manufacturer to locate in Wildwood." He added:

"Additional experiments are to be made and we are hopeful that the salt hay will have a far more intrinsic value than in its present use for bedding down horses or packing silverware."

Low Water Affects Plants in Corinth

CORINTH, N. Y., February 5, 1940—Power plants and paper mills in this vicinity are being forced to curtail operations to about 80 per cent of capacity because of the extreme low water conditions. Since the shutdown of one of the eight papermaking machines at the local plant of the International Paper Company it was learned that other plants have had to follow suit. Due to the most severe water shortage in its history the mill of Finch, Pruyn & Co. was forced to omit starting two paper machines at the usual morning hour last week but the afternoon shift resumed work with the machines in action. About fifteen men are affected and the omission of the one shift means lost time to each man. Among the plants affected are the Sherman Island hydro plant of the International Paper Company; Feeder Dam plant of Finch, Pruyn & Co., Glens Falls; Union Bag and Paper Corporation, Hudsons Falls; International Paper Company, Fort Edwards; West Virginia Pulp and Paper Company, Mechanicville, and the Spiers Falls hydro-electric plant of the New York Power and Light Company.

Orono Unbleached Sulphite Mill Commences Operations

The Eastern Corporation, Bangor, Maine, has announced that its unbleached sulphite pulp mill, located at Orono, Maine, on which a considerable sum has been spent for modernization and improvement, will begin production in the very near future. Manufacturing operations are in charge of A. S. Cosler, who has had extensive experience in the manufacture of pulp. The technical facilities of the Eastern Corporation in the production of sulphite will be available in full to the Orono mill.

It is anticipated that the Orono mill will have a daily production of 50 tons of prime unbleached

Air View of Orono Mill

sulphite which will be put up in dry compressed bales to facilitate shipment to the many papermaking districts. Under present conditions, American paper manufacturers have already welcomed this new domestic source of supply of unbleached pulp as an addition to their present connections. To date a very substantial portion of the 1940 tonnage has already been sold. Such satisfactory progress has already been made that it is expected pulp shipments will begin in mid-February.

Gottesman & Co., Inc., of New York, agents for Eastern Corporation's bleached sulphite paper pulp and rayon pulp, are also handling the exclusive sale of the unbleached sulphite pulp to be produced by the Orono mill.

H. P. Smith Co. Leases New Building

Chicago, Ill., February 14, 1940—The H. P. Smith Paper Company, wax paper manufacturer, 1129 West Thirty-seventh street, has leased for fifteen years a new building to be constructed on the southwest corner of S. La Vergne avenue and West Sixty-sixth street in the district. The plant will contain approximately 50,000 square feet of floor space, doubling the company's present facilities.

The new plant will be a one-story, daylight, continuous flow structure, measuring 200 feet by 246 feet. Building features include an inside depressed switch track with a capacity of four cars and an enclosed depressed truck dock with a capacity of three trucks.

N. P. T. A. Gains New Members

Three important local wrapping paper associations in the metropolitan New York area have recently been added to the enrollment of the National Paper Trade Association. These are the Metropolitan Bag and Paper Jobbers Association, the Cosmopolitan Twine and Paper Association and the Paper Trade Association of New Jersey.

The addition of these organizations, numbering upwards of fifty individual houses is welcomed with enthusiasm, since it greatly improves the representative position and increases the helpful influence of the National Association not only in New York City but throughout the country.

In recognition of this happy development and as a gesture of welcome to these new members, the association has invited them as guests at an informal dinner to be held at 7 o'clock, Monday evening, the first day of the Convention, at Longchamps restaurant, 42nd street and Lexington avenue. No program has been arranged since it is desired merely to have a jolly social gathering to promote acquaintance with the new members. A full list of the individual houses comprising the new Association memberships is given below:

Metropolitan Bag and Paper Jobbers Association: Cordano Brothers, New York; John H. Free, Inc., Brooklyn; Samuel Hayward, Yonkers; Fred W. Hinrichs, Inc., New York; A. E. MacAdam & Co. Inc., Brooklyn; Thos. J. Nagle, Inc., Hollis, N. Y.; Charles Norz, Brooklyn; S. Posner Sons, Inc., Jamaica, N. Y.; Alex Seifman, Brooklyn; Benjamin Silfen, Inc., Brooklyn; H. Schroeder Paper Supplies Company, Long Island City; Yorkville Paper Company, Inc., New York; Arnold H. Moller, Bloomfield, N. J.

Paper Trade Association of New Jersey: J. Y. Burnett & Co., Bayonne, N. J.; Clinton Hill Paper Company, Irvington, N. J.; Commercial Paper Bag Company, Newark, N. J.; Elite Food Products, Newark, N. J.; Grossman Paper and Bag Company, Irvington, N. J.; Jersey Paper Company, New Brunswick, N. J.; J. Liberman & Co., Jersey City, N. J.; Miller-Kaimer Company, Elizabeth, N. J.; Monmouth Paper Supply Company, New Brunswick, N. J.; H. G. Mooney Company, Newark, N. J.; M. J. Riehs, West New York, N. J.; Ringel Bros., Newark, N. J.; Stanley Paper Company, Newark, N. J.; S. Susskind & Co., Bayonne, N. J.; Union Paper Co., Red Bank, N. J.; Wiskind Brothers, Inc., Newark, N. J.

Cosmopolitan Twine and Paper Association: Harlem Paper Products, New York; H. Pollack, Brooklyn; Globe Paper Company, New York; Finkel Paper Company, Brooklyn; Federal Paper Company, Brooklyn; Imperial Bag and Paper Company, New York; Nathan Fisher, Brooklyn; Merit Paper Company, Brooklyn; Triboro Paper Company, New York; Continental Supply Company, New York; Charles Fisher, Brooklyn; Amsterdam Paper Company, New York; Le Roy Paper Company, Brooklyn; H. Engelhard, Brooklyn; Royal Paper Company, New York; Rothman-Best Paper Company, New York; A. Weitzman's Sons, New York; Long Island Paper Company, Corona, N. Y.; Jefferson Paper Company, New York; Grand Paper Company, New York.

Wendell Berge To Speak

The annual open meeting of the American Paper and Pulp Association will be held on Wednesday, February 21, 1940, beginning at 2:30 P.M., in the Astor Gallery of the Waldorf-Astoria, New York, N. Y. There will be reports from officers, committees and divisions of the association, and from other paper industry associations. The association feels that it is fortunate to have as principal speaker, Wendell Berge of the Department of Justice, who will talk on the relation of the Anti-Trust Laws to trade association work.

Mr. Berge is special assistant to Thurman Arnold, head of the Anti-Trust Division of the Department of Justice, and is in active charge of the work of the whole division. Because of his work he is, of course, in the best possible position to discuss this topic which, in recent years, has become more and more prominent in the thoughts of business men.

That his talk will be predicated on a wealth of knowledge is attested by Mr. Berge's experience in this field.

Wendell Berge is a graduate of the University of Nebraska and of the University of Michigan Law School. He commenced active law practice in 1928 in New York with the firm of Root, Clark, Buckner & Ballantine. Since 1930 he has been continuously on the staff of the Anti-Trust Division of the Department of Justice. For five years he was engaged in trial and appeals work for the division, becoming in 1935 Chief of the Appellate Section of the division, responsible for all briefs filed by the Anti-Trust Division in the Appellate Courts, including the United States Supreme Court. In 1937 he was made chief of the Trial Section and shortly thereafter raised to his present position.

Since July, 1938, Mr. Berge has been, in addition, alternate for Mr. Thurman Arnold as Department of Justice representative on the Temporary National Economic Committee.

On the basis of this broad experience the industry is assured of a message of particular interest to every member and one that will establish the basis for discussions that are of utmost importance in the future policies of the Association.

Edward H. Stone Dead

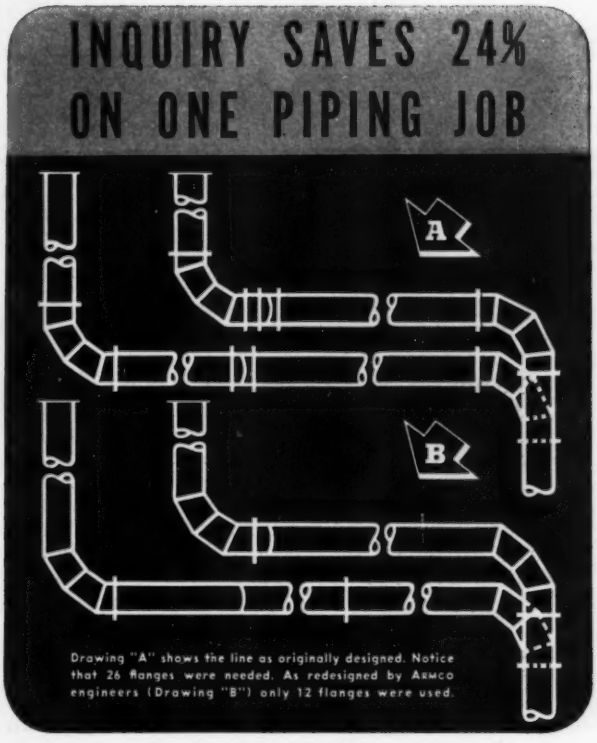
[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 12, 1940—Edward H. Stone, co-founder and chairman of the board of directors of Stone & Forsyth Company, well known in the paper trade, died February 10 in his 89th year at his home, 100 Cambridge street, Winchester, Mass.

Mr. Stone was born in Boston on Kingston street, a short distance from the site of the business he incorporated with the late James B. Forsyth in 1881. He served as its treasurer for 50 years. He had lived in Winchester since he was two years old and was a selectman and a trustee of the Winchester Savings Bank.

His widow; a son, Robert M. Stone, vice-president of Stone & Forsyth Company; two daughters, Miss Mildred Stone and Mrs. Carl W. Wood, all of Winchester, and two grandchildren are living.

Services were held from his home today, followed by burial in Wildwood Cemetery.


INQUIRY SAVES 24%
ON ONE PIPING JOB
A
B
Drawing "A" shows the line as originally designed. Notice that 26 flanges were needed. As redesigned by ARMCO engineers (Drawing "B") only 12 flanges were used.

Here is the true story of a purchasing agent who asked to be shown . . . and saved time and money for his company as a result.

He had heard about the possibilities for saving with ARMCO Spiral Welded Pipe. So when new pipe was needed for water legs between an Oliver filter and sump he sent the plans to ARMCO.

A few changes in design brought a saving of 24%! By using longer lengths of ARMCO Pipe, shop-fabricated fittings and fewer joints the cost was cut from $345.96 to $262.66. And savings didn't stop with this reduction in purchase price. ARMCO Pipe was easy to handle and fewer joints meant less assembly work. Maintenance is sure to be less because there are fewer potential sources of costly joint leakage.

There is an even greater opportunity for economy on larger jobs. Why not learn how much *you* can save by using ARMCO Spiral Welded Pipe? Just send us your plans and specifications. The American Rolling Mill Company, Pipe Sales Division, 361 Curtis Street, Middletown, Ohio.

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SPIRAL WELDED PIPE

CONSTRUCTION NEWS

Bogalusa, La.—The Gaylord Container Corporation, Pulp and Paper Division, 2820 South 11th street, St. Louis, Mo., manufacturer of kraft paper and paper board products, container liners, etc., has plans under way for expansion and improvements in mill at Bogalusa, including construction of new production units and installation of equipment to increase capacity of different stocks from 500 to 600 tons per day. Entire project is reported to cost close to $1,000,000, with equipment. It is proposed to carry out work in the spring.

Milwaukee, Wis.—A. George Schulz Company, 133 West Oregon street, manufacturer of paper boxes and containers, has approved plans for improvements in plant, including a new loading platform, two canopy structures and other work. Award for structural steel has been made to the C. Hennecke Company, and for frame construction to Arthur A. Wolff, Inc., both Milwaukee. Work is scheduled to be carried out at once.

Kalamazoo, Mich.—The Sutherland Paper Company, manufacturer of box board, manila-lined stocks, etc., is arranging an appropriation of about $500,000 for expansion and improvements in mill during the present year. Work will include construction of new additions and installation of equipment for large increase in present capacity, as well as modernization and improvements in different sections of existing mill. Proposed to begin work in the spring. During 1939 the company expended a fund of approximately $600,000 for similar expansion and betterments.

Brooklyn, N. Y.—The Mohawk Container Corporation, recently organized with capital of 200 shares of stock, no par value, plans early operation of local plant for the manufacture of paper boxes and containers. New company is represented by the Continental Lawyers Albany Service, 305 Broadway, New York.

Middletown, Conn.—The Robert Gair Company, Inc., 155 East 44th street, New York, N. Y., manufacturer of corrugated boxes and containers, is reported negotiating for the purchase of a tract of land at Air Line avenue and Pickering street, Middletown, as site for proposed new branch plant. It is said that title to the property will be taken at early date and plans prepared for plant, to consist of several one-story units for large capacity. No estimate of cost has been announced.

Cohoes, N. Y.—The Mohawk Paper Mills, Inc., manufacturer of writing and other paper stocks, has awarded general contract to J. P. Sewell, Hudson avenue, Albany, N. Y., for proposed new addition to mill, recently referred to in these columns, and will proceed with erection at once. It will be three-story and basement, 50 x 60 feet, reported to cost in excess of $70,000, including equipment. Large increase in present capacity will be carried out. C. F. Egan, Burdett Building, Troy, N. Y., is architect.

Mount Vernon, Ohio—The Shellmar Products Company, Mount Vernon, manufacturer of cellophane containers, etc., is considering preliminary plans for new addition to processing and converting plant, to be of one-story type, with facilities for large increase in present production. Estimates of cost and details will be determined soon. Erection is scheduled to be carried out in 1940.

Cheboygan, Mich.—The North American Pulp and Paper Corporation, manufacturer of book, bond and other paper stocks, has plans nearing completion for proposed new addition to mill, previously referred to in these columns, and will proceed with erection at early date. It will be one-story, designed primarily for expansion in storage and distributing division, and is reported to cost in excess of $40,000, with equipment. Harold Thompson, Mullet Lake, Mich., is architect.

East Paterson, N. J.—The Marcal Pulp and Paper Company, organized to manufacture a line of paper goods, has concluded arrangements for the purchase of the former plant of the Crew Piece Dye Works, River road, East Paterson, heretofore held by the municipality. The property consists of a tract of about 10 acres of land, with main one and multi-story unit and group of smaller buildings, providing large floor space. New owner will take immediate possession and will modernize and equip for new mill. Machinery and facilities will be installed for employment of about 350 workers. It is expected to have the mill ready for service at early date. Project will represent an investment of close to $100,000.

New York, N. Y.—The Shomer-Majestic Paper Box Company, Inc., 510 Sixth avenue, manufacturer of corrugated boxes and containers, has arranged for lease of building at 335 West Sixteenth street, totaling about 60,000 square feet of floor space, and will improve and equip for new plant. Present works will be removed to new location and large increased capacity carried out.

Williamsport, Pa.—The C. A. Reed Company, Chestnut street, manufacturer of crepe and other paper stocks, has closed bids on general contract for erection of proposed new two-story and basement addition to mill, 80 x 180 feet, previously referred to in these columns, and award for work is scheduled to be made at early date. It is reported to cost over $60,000, including equipment. Clarence E. Wagner, 51 West Third street, Williamsport, is architect.

New Companies

Allegan, Mich.—The Vince-Williams Company, Inc., has been organized with capital of $50,000, to manufacture and deal in paper products of various kinds. New company is headed by Maurice G. Vince, 111 Bond street, Allegan.

New York, N. Y.—King Brands, Inc., has been incorporated with capital of 200 shares of stock, no par value, to deal in paper products of various kinds. O'Brien, Driscoll & Raftery, 152 West 42nd street, attorneys, represent the new company.

Dallas, Tex.—The Asbestos and Roofing Company has been organized to manufacture and deal in prepared roofing, roofing papers, etc. W. M. Filler, 325 Second street, Dallas, is one of the principal incorporators and representative.

Elkton, Md.—The C. & L. Printing & Specialty

Company has been organized to manufacture and deal in paper products of various kinds. Walter C. Miller, Elkton, is one of the principal incorporators and representative.

Randolph, Mass.—The Norfolk Paper Company, Inc., 31 West street, has been incorporated with capital of $40,000, to manufacture and deal in paper products of various kinds. C. Lloyd Claff is president and treasurer.

Chicago, Ill.—The Ace Flower and Novelty Company, Inc., 29 South LaSalle street, has been organized with capital of $100,000, to manufacture paper and other artificial flowers, and paper specialties. Incorporators include J. Lasner and Emanuel Morris, address noted. Last noted is company representative.

New York, N. Y.—The Udine Paper Company, Inc., has been organized to deal in paper products of various kinds. New company is represented by Joseph J. Nista, 260 East 161st street, Bronx, attorney.

R. I. Findlay Heads Paper Merchants

TORONTO, Ont., February 5, 1940—R. I. Finlay, head of the United Paper Mills Ltd., Toronto, was elected president of the Canadian Wholesale Paper Dealers' Association at their 22nd annual meeting which was held recently and was well attended. He succeeds H. F. E. Kent, president of the W. J. Gage & Co. Ltd. Toronto, who had filled the position for the last two years. T. Havill of the T. Havill Paper Company, Montreal, was elected vice-president. T. J. Macabe of Buntin, Reid and Co., Toronto, was re-elected treasurer and Ivan Moffitt, Toronto, was again made secretary.

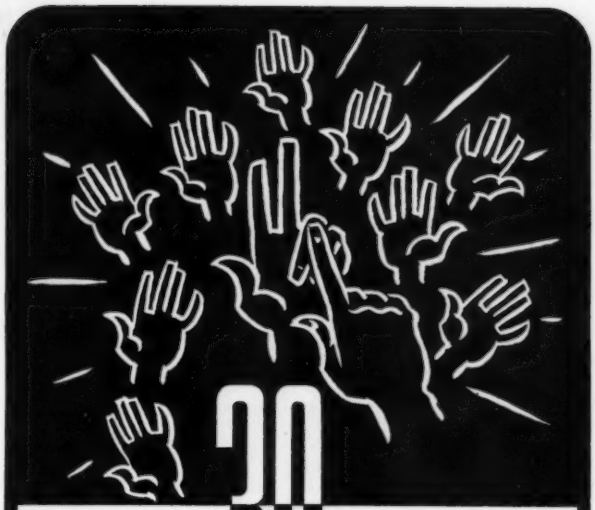
At the annual banquet which was held in the evening, representatives of the paper mills were guests of the association and a jolly time was spent. H. F. E. Kent, retiring president, ably presided and the speaker of the evening was Alex Edmison who is an alderman in that city and much interested in social service work. His topic was "Headlines of the News".

The toast to "Our Guests" was proposed by R. I. Finlay, the newly elected president. Among the prominent guests present were; Harold Crabtree of Howard Smith Paper Mills Ltd., John Rolland of the Rolland Paper Company, W. S. Kidd, general manager of the E. B. Eddy Company and John F. Taylor, vice president of the company, all of whom made suitable responses. A warm welcome was extended to two newcomers in the persons of N. E. Wainwright, of Buntin, Gillies & Co., Hamilton, and John Neville, Ottawa, who lately organized the John Neville Paper Company of that city.

Paper Bought Under Walsh-Healey Act

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 14, 1940—During the week ended January 27, the Government purchased $23,628.75 worth of paper and allied products under the Walsh-Healey Act as follows: Eastern States Carton Div., Robert Gair Company, Brooklyn, N. Y., $10,508.75 worth of folding boxes for the Procurement Division; and Marquette Paper Company, Chicago, Ill., $13,120.00 worth of cover paper and printing paper for the War Air Corps.



30 hands are not enough to count the important paper mills using

CINCINNATI ROLL COVERS

THE CINCINNATI RUBBER MANUFACTURING CO.
CINCINNATI, OHIO

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for the Week Ending February 14, 1940

	High	Low	Last
Armstrong Cork Co.	41	40¼	40¼
Celotex Corp.	12⅜	9⅞	12⅛
Celotex Corp., pf.	65	65	65
Certain-Teed Products Corp.	8	6½	7⅞
Certain-Teed Products Corp., pf.	33¾	29	33⅜
Champion Paper & Fibre Co.	23⅞	22¾	22¾
Champion Paper & Fibre Co., pf.	104	103½	103½
Congoleum-Nairn Co.	23⅝	23⅛	23¼
Container Corp. of America	16¾	15¾	15¾
Continental-Diamond Fibre Co.	7¼	6⅞	7⅛
Crown-Zellerbach Co.	17⅛	16¼	16¼
Crown-Zellerbach Co., pf.	91¼	89½	89½
Flintkote Co.	20¼	19¼	20⅛
Robert Gair	3⅜	3⅜	3½
Robert Gair, pf.	14⅞	14½	14⅞
International Paper & Power	14¼	13¼	13⅜
International Paper & Power, pf.	60¼	57	57½
Johns-Manville Corp.	73	71½	72½
Johns-Manville Corp., pf.	126	124½	124½
Kimberly Clark Corp.	36¾	35¾	36¾
MacAndrews & Forbes	34	34	34
Masonite Corp.	39	38⅝	38⅞
Mead Corp.	11	10¼	10¾
Paraffine Companies, Inc.	43½	42	43½
Rayonier, Inc.	18½	17¼	17¾
Rayonier, Inc., pf.	28	27	27
Ruberoid Co.	19½	18⅞	19½
Scott Paper Co.	47½	46¾	47
Scott Paper Co., pf.	112¾	112¾	112¾
Sutherland Paper Co.	29½	29	29
Union Bag & Paper Corp.	14⅜	13⅜	13⅞
United Paperboard Co.	4⅞	4½	4½
U. S. Gypsum Co.	85¾	83¾	85¾
U. S. Gypsum Co., pf.	177	177	177

New York Curb Exchange

High, Low and Last for the Week Ending February 14, 1940

	High	Low	Last
American Box Board Co.	6½	6½	6½
Brown Co., pf.	27	24¾	26
Great Northern Paper	43¼	43¼	43¼
National Container Corp.	11¾	11¼	11¼
St. Regis Paper Co.	3⅛	2⅞	2⅞
St. Regis Paper Co., pf.	71¾	70½	70½
Taggart Corp.	5⅛	5	5

Strathmore Has Sharp Rise in Profits

[FROM OUR REGULAR CORRESPONDENT]

WEST SPRINGFIELD, Mass., February 14, 1940—A sharp, rise in profits in 1939 is noted in the report of the Strathmore Paper company of West Springfield. The net income amounted to $337,733 as compared with the 1938 figure of $2,253. Flood losses for 1938 amounting to $241,181 had been charged off the latter figure.

The 1939 net sales were $3,003,346 and for the previous year, $2,724,703. The balance sheet at the close of the last calendar and fiscal year showed current assets of $1,771,769 including cash of $218,521; current liabilities of $762,406; net working capital, $1,009,363. Horace A. Moses, the president, held 18,324 shares, at the close of December, 1939, of the outstanding shares totaling 93,662 shares of common and 3008 shares of the outstanding 18,328 shares of preferred.

United Paperboard Nets $42,025

The United Paperboard Company and subsidiaries for the quarter to November 25 reports a net profit of $42,025, equal after dividend requirements on 9,876 shares of $100 par, 6 per cent, non-cumulative preferred stock, to 11 cents each on 240,000 shares of $10 par common stock. In the preceding quarter the company had a net loss of $42,598 and one of $13,875 in the November quarter of 1938.

Union Bag Earns $965,532

Operations of Union Bag & Paper Corporation in 1939 resulted in a net profit of $965,532 after all charges including depreciation and income taxes, according to a preliminary statement (subject to final audit) for the year made public today by Alexander Calder, President. This is equivalent to 76 cents per share on 1,262,729 shares of outstanding capital stock which was increased during the year by the sale of an additional 210,455 shares. It compares with 1938 net profit of $903,892, equal to 72 cents per share on the same number of shares.

A sharp upturn in earnings took place in the fourth quarter when net profit of $525,482, including year-end adjustments, accounted for more than half of the year's total.

Gross sales for 1939 reached a new high record of $17,579,260 compared with $16,517,875 in the previous year, Mr. Calder announced. Of the year's total sales, $5,090,337 resulted from fourth quarter operations.

The sharp increase in earnings in the final quarter was despite a normal carryover of business taken at the low prices in effect during the summer, Mr. Calder said. Accordingly the full effect of price advances made in the fall was not felt in the fourth quarter.

Mr. Calder pointed out that current prices of paper bags are approximately the average of the last five years and that the price advances which took place last fall were merely a normal recovery from unjustifiably low levels.

Brompton Nets $349,947

The financial report of the Brompton Pulp and Paper Company, Limited, for 1939, shows substantially higher gross and net profits and an increase in net working capital of some $300,000 to $2,419,651, with an 8-to-1 ratio of current assets to current liabilities. Among current liabilities, a bank loan of $368,297, shown at the end of 1938, has been eliminated, while, among current assets, cash has risen from $100,302 to $389,398.

Operating profit at $774,034 compared with $403,281 for 1938, $736,179 for 1937. After all charges, including depreciation at $369,156 (vs. $271,571 for 1938), net profit at $349,947 compared with $119,232 for 1938, $403,282 for 1937. The year's net was equal to $1.16 per share, against $0.40 for 1938, $1.34 for 1937.

St. Lawrence Earnings Rise

The report of the St. Lawrence Paper Mills Company, Limited, for 1939 shows a marked expansion in operating profit, $840,297 comparing with $466,620 for 1938, $747,794 for 1937. Newsprint sales totalled 103,397 tons, as compared with 94,490 tons for 1938, 147,417 tons for 1937. After writing off $752,581 to depreciation account plus $25,617 for depletion, net profit for the year was $62,099, against

$58,045 for 1938, for which year depreciation provision was $325,000. This net was equal to 42 cents a share on the $100 6 per cent preferred, against 41 cents for 1938.

Balance sheet position shows a substantial improvement, with net working capital standing at $1,424,385, against $659,333. Bank loan has been reduced by $552,153 to $1,733,100, but payables are over $100,000 higher at $380,675. Of total receivables of $888,000, $469,614 is due from Hearst Companies, in connection with which the auditors' certificate reads "We are not in a position to express an opinion as to the ultimate value of this asset."

Lake St. John Profits Up

The report of the Lake St. John Power and Paper Company, Limited, for the year 1939 shows substantial expansion in operating profits combined with an improvement in balance sheet position, a bright spot being the reduction of $760,000 in the bank loan, leaving $436,500 outstanding as of the year-end. Operations at the mill, states A. Stewart McNichols, president, in reporting to shareholders, were on the basis of 58 per cent of rated capacity, against 50 per cent for 1938. "A somewhat higher output is indicated for 1940," he adds.

Operating profit at $773,472 compared with $582,121 for 1938. After charging depreciation at $286,204 (vs. $138,691 for 1938), balance of $487,268 sufficed exactly to cover both bond and debenture interest. A year ago, there was a deficit of $43,838 after such charges.

The balance sheet shows current assets at $3,159,146, against $3,388,781 a year ago. Among receivables of $1,353,386 is the amount due by the Hearst Companies of $1,105,650, which shows a reduction of $181,108 for the year. In reference to this receivable the auditors' note reads: "We are not in a position to express an opinion as to the ultimate value of this asset."

Hummel-Ross Nets $192,144

The Hummel-Ross Fibre Corporation for 1939 report a net profit after depletion, interest, obsolescence, depreciation, Federal income and excess profits taxes, of $192,144, equal, after 6 per cent preferred dividends, to 39 cents each on 389,636 shares of $5 par common stock, excluding treasury shares. Net profit in 1938 was $53,450, or 3 cents a share. Net sales for 1939 aggregated $2,624,181. As of Dec. 31, last, current assets were $613,371 and current liabilities, $132,033, compared with $571,917 and $135,964, respectively, at close of previous year. Surplus stood at $667,195 at year end. At beginning of 1939 it was $588,140.

Eddy Earns $1.77 a Share

The Eddy Paper Corporation for 1939 report a net income of $328,404, or $1.77 a capital share compared with a net income of $212,336, or $1.14 a share for 1938.

Keyes Fibre Profits Up

The Keyes Fibre Company for 1939 report a net profit of $205,217 compared with $110,232 for 1938.

Maclaren Earns $1,712,116

The annual financial statement of the Maclaren Power and Paper Company and subsidiaries shows consolidated net earnings for the year ending November 30 last at $1,712,116, before depreciation, depletion, etc., compared with $1,241,148 in the previous year, a gain of $470,969.

After deducting $658,902 for depreciation, depletion and amortization, and $973,993 for bond interest, etc., there remained balance of $79,221, against a deficit of $612,694 in the preceding year. After adding an amount of $9,265 representing profit on sale of investment, there was a profit of $88,486 before providing for income taxes. Earned surplus at November 30, 1939, was $1,106,516, compared with deficit of $374,379 a year before.

Current liabilities, exceeded current assets by $1,950,120 at November 30 last, compared with a working capital deficit of $1,652,444 at November 30, 1938.

St. Lawrence Earns $33,015

The financial statement of the St. Lawrence Corporation, Limited, which has as its subsidiaries St. Lawrence Paper Mills Company, Limited, Brompton Pulp and Paper Company, Limited, and Lake St. John Power and Paper Company, Limited, discloses the position of the holding company as at December 31, 1939. Revenue of the company in the latest year was a dividend received from Brompton Pulp and Paper Company of $327,878. After deducting expenses and payment of $1 per share on account of arrears of dividends on Class "A" preferred shares there remained a surplus of $17,442 for the year, raising earned surplus to $33,015. Balance sheet showed total assets of $15,662,544. Bank loan was reduced $17,422 to $146,611. Arrears of dividend on the Class "A" $2 cumulative preferred were $15.25 per share as at December 31, 1939.

Celotex Prospects Bright

Bror Dahlberg, president of the Celotex Corporation, told stockholders at their annual meeting at Chicago on January 30 that the outlook for 1940 was good.

Net income last year of the Certain-teed Products Corporation, in which Celotex has a substantial interest, Mr. Dahlberg said, "will be a little over $600,000," compared with $171,000 in 1938. Earnings of the Sloane-Blabon Corporation, a Certain-teed subsidiary, he said, would be a "little in excess of $500,000, compared with a 1938 loss of $209,000."

Celotex's stockholders approved a reduction in the number of directors from eleven to nine and re-elected the nine directors now serving.

National Reports $495,563 Profit

The National Folding Box Company for 1939 reports a net income of $495,563, equal to $4.24 a share on the capital stock, against $392,797, or $3.37 a share, the year before.

The Kalamazoo Vegetable Parchment Company and subsidiaries for 1939 report a net income of $874,019, equal to $1.75 each on 500,000 capital shares, against $659,229 or $1.32 a share in 1938.

PAPER TRADE JOURNAL

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Henry J. Berger
EDITOR

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COMING EVENTS IN PAPER INDUSTRY

American Paper and Pulp Association, Sixty-third Annual Convention and meeting, Waldorf-Astoria Hotel, New York. February 19-22.

Technical Association of the Pulp and Paper Industry, Convention, Roosevelt Hotel, February 19-22.

Salesmen's Association of the Paper Industry, Annual Meeting and Luncheon, Waldorf-Astoria Hotel, New York, Tuesday, February 20.

National Paper Trade Association of the United States, Convention, Waldorf-Astoria Hotel. New York. February 19-22.

New York Association of Dealers in Paper Mills' Supplies. Annual Banquet, Hotel Commodore, New York, February 20.

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

NATIONAL DEBT AND RECOVERY

Few business men can agree with President Roosevelt's theories of a higher level of prosperity and least of all with his theory of the national budget. The President said that "it would be time enough to think about balancing the budget when the national income had been raised to the neighborhood of $80,000,000,000. That statement is not likely to increase confidence in the New Deal and it must raise doubt in many minds whether the budget can or will be balanced when the national income reaches that figure. At the current rate of expenditures $85,000,000,000 would probably be required and if attained, there is no assurance that the same theory would again be applied to defer balancing until the national income rose to $90,000,000,000 or some other figure.

The President's theory does not make sense and it has been severely criticized along with the President's assertion "that the total debt of the United States, private debt, State and local governments debt, and the debt of the Federal Government in 1939 was less than it was in 1932, by around two billion dollars".

A reply to President Roosevelt's claim was placed in the Congressional Record on February 8 by Senator Harry Byrd, and his figures, collected by the economy advocates of the Senate show that the total Federal debt in 1929 was $16,931,000,000, State and local debts, $16,931,000,000, private debts, $124,700,000,000 total debts, $158,391,000,000, in 1933, the Federal debt was $22,538,000,000, State and local debts, $19,517,000,000, private debts, $98,000,000,000, total debts $140,000,000,000. In 1939, the Federal debt was $40,439,000,000, State and local debts, $19,626,000,000, private debts, $92,500,000,000 and total debts, $152,565,000,000. These figures were collected by Senator Byrd from Treasury Department reports and those on private debts from studies made by the Division of Program Planning of the Agricultural Adjustment Administration. The data shows a public and private debt rise of $12,500,000,000 between 1936 and 1939.

In commenting on the attacks of Congress on spending, the current issue of the *Washington Review* published by the Chamber of Commerce of the United States states in part: "As the eyes of the country turn toward Congress, watching its efforts to make a start toward federal economy, it is evident that much will depend upon the attitude of the public, the ability of Congress to resist pressure groups and on Presidential recommendations for supplementary appropriations, one of which has already been submitted. The history of budget making in recent years is not encouraging. During the last three fiscal years actual expenditures exceeded the original budget estimates by an annual average of 1.8 billion dollars.

"The appropriating mechanism of Congress is weak and not well adapted for efficiency and economy. Hearings on appropriation bills are unsatisfactory. Representatives of the public are usually not invited; only the spokesmen for spending agencies are heard. The rules governing appropriations likewise are not conducive to sustained economy. Appropriation bills are voted individually as may suit the convenience of Congress. At no time is the budget as a whole considered, nor is there any adequate opportunity afforded either to debate or to determine broad fiscal policies. A Congressional budget agency which would consider the budget as a whole and make recommendations to Congress as to expenditures, revenues and debt policy, including aggregate total of expenditures, would be a potent instrument for converting the present nascent economy tendency in Congress into realistic achievement."

In a formal speech at St. Paul, Minn., on February 10, Senator Arthur H. Vandenberg of Michigan said the American people are tired of "boondogglers, barnacles, ballyhoo and bankruptcy." His specific program for recovery, which formed his personal platform, was in part: "Do everything to legitimately encourage free enterprise and the honest profit motive in private business. Undo everything which needlessly discourages business and aggravates the uncertainties and the timidities which hamper success and prosperity. Do everything that puts government itself on dependable foundations. Undo everything that makes government wabble and needlessly puts it in the way of recovery and re-employment. Stop the hymns of hate which dynamite us

into devastating factions. Quit government competition with private business and reduce regulation to whatever real necessity requires in the obvious public interest. Demobilize the bureaucrates; scrape off the payroll barnacles.

"Repeal the floating Presidential money powers so that our currency is tied to something more substantial than the Presidential whim. Stop buying all the gold and silver in the world at swollen prices when we already have twice as much as we can use. Stop buying gold from Russia at $35 an ounce which Russia produces for $11 an ounce. Put our tariffs on a dependable cost of production basis so industry and labor and agriculture may known what to expect. Remove all tax deterrents, as identified by the present Treasury itself, and substitute tax incentives to the profits system. Amend the Securities and Exchange Act to remove needless obstacles to new financing while retaining all protection against piracy.

"Amend the Wagner Act to remove needless and costly discouraging frictions in labor relationships and separate the functions of the National Labor Relations Board so that judge and prosecutor are not in one tyrant; yet zealously protect every essential element of free collective bargaining. . . . Balance the budget as rapidly as sound business judgment will permit. . . . Pay as much attention to the man from whom we take a dollar as to the man to whom we give it. Stop the Houdini business of deliberate deficit-spending and admit, once more, that thrift is more prudent than debt."

Japan Controls Paper Industry

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 14, 1940—The paper industry thus far has been least affected by the many rigid control measures adopted by the Japanese government covering consumption of raw materials, production and distribution. The position may be explained mainly by the fact that the industry is practically self-sufficient as regard raw materials, that it produces an article greatly in demand in the domestic market and that it has built up an important and flourishing export business. During the third quarter of 1939, however, the government took steps to exercise greater control over the paper industry, the moving factor for such action being the shortage in supplies of electric power and coal. Other important considerations included the increased shortage of wood for pulp manufacture and reduced supplies of caustic soda which in September was placed under official control.

Reversing the trend witnessed during the first and second quarters of 1939, companies of the Japan Paper Manufacturers Association during the third quarter turned out more paper than was sold during the period. The output, according to figures released by the association, totaled 259,695 short tons, and was the largest since the third quarter of 1937. Sales declined from 270,272 tons during the second quarter to 256,967 tons during the third quarter, but the total sold was well above the quarterly average in 1938.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1940	1939	1938	1937	1936	1935	1934
January	91.1%	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	.....	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	.....	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	.....	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	.....	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	.....	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	.....	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	.....	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	.....	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	91.1%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	84.9%	72.3%	80.6%	81.3%	70.5%	.....
First 5 weeks	91.1%	78.1%	64.5%	89.9%	76.4%	65.8%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1940		CORRESPONDING WEEKS, 1939	
December 30, 1939	76.2%	December 31, 1938	62.8%
January 6	89.2%	January 7	70.0%
January 13	94.1%	January 14	80.4%
January 20	91.8%	January 21	78.0%
January 27	91.7%	January 28	81.4%
*February 3	87.8%	February 4	80.7%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Dec. 30, 1939	Jan. 6, 1940	Jan. 13, 1940	Jan. 20, 1940	Jan. 27, 1940	Feb. 3, 1940
0% to 50%	60	51	46	36	44	33
51% to 100%	246	242	247	248	226	153
Total Mills Reporting	306	293	293	284	270	186

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%
1940	71%	....	....	....	....	....	....

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	71%	70%

Week end. Dec. 30, 1939—46%
Week end. Jan. 6, 1940—65%
Week end. Jan. 13, 1940—74%
Week end. Jan. 20, 1940—72%
Week end. Jan. 27, 1940—75%
Week end. Feb. 3, 1940—72%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

* Preliminary figure.

Collects Dumping Duties

For the first time since the Reciprocal Trade Agreement Act was passed in 1934, the Treasury Department has issued a dumping order for the collection of dumping duties. Oddly enough, the first such action included four rulings of dumping on paper goods, affecting ribbon fly catchers from Japan, Belgium, United Kingdom and Germany. An order was also issued on wool berets from France. It is worthy of notice that the dumping order on fly catchers from Belgium affects a commodity on which the duty rate was reduced in the Belgium Trade Agreement. Whether this action indicates a new policy as to enforcement of the Anti-Dumping Act remains to be seen. For five years no industry has been able to secure an anti-dumping order on any imported commodity and complaints by the Import Committee of the American Paper Industry against the dumping of foreign paper have not been successful.

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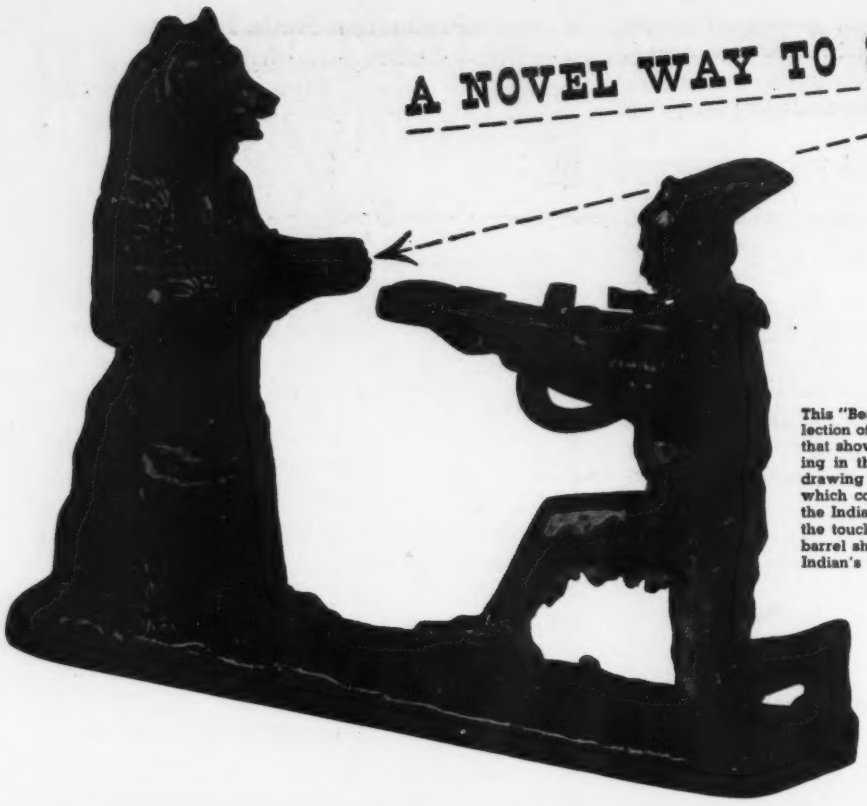

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Instrumentation Studies. XXXV.

The Clark Paper Softness Tester, with an Important Note on the Gurley Stiffness Tester

By The Staff of The Institute of Paper Chemistry

Abstract

The operating technique for the Clark paper softness tester has been studied in some detail. The overhanging length of the paper strip inserted in the roller mechanism of the instrument has been found to bear a straight-line relationship to the angle of rotation necessary to cause the strip to fall over.

The correlation between Clark rigidity and Gurley stiffness was poor for limp papers but somewhat better for stiff papers. One of the principal reasons for this poor correlation was found in a large source of error in the Gurley method, wherein errors range up to about 90 per cent of the apparent Gurley stiffness.

Clark rigidity was found to correlate well with flexural rigidity as determined by a research method involving a torsion pendulum.

Subjective tests for softness of facial tissue, towel tissue, waxing glassine, and bread wrappers correlate with the mean of the machine direction and the cross direction Clark softness values.

The accuracy of determinations carried out on the Clark paper softness tester depends largely on the nature of the paper tested. For heavy, uniform papers, five determinations in each direction are sufficient, but at least ten representative strips in each direction are necessary for lightweight papers.

The Clark paper softness tester was designed to measure the flexural rigidity and softness of paper, which are important use-requirement characteristics of many grades. The objectives of the present work were to determine the accuracy with which these properties are measured, to investigate the effect of various factors affecting the test and, if possible, to correlate the results with the probable behavior of the paper under actual use conditions.

Description of Instrument

The Clark paper softness tester (see Fig. 1) consists of two rollers A held together by spring pressure, one of which may be turned slowly by means of a worm drive B. The line of contact of the rollers coincides with the axis of rotation of the supporting framework C, and a pointer D attached to the frame indicates the relative angular position of the framework with respect to a rotatable circular scale E. A strip of paper having parallel edges is inserted between the rolls. Its overhanging length is adjusted by turning the rolls until, when the framework is turned back and forth through 90 deg., which is done with a slow geared adjustment F, the strip just falls over when each of the two extreme positions is reached. (Hereafter this length will be referred to as "critical length.") Using a millimeter rule, the overhanging length is determined by measuring from an abutment on the framework which is placed at a fixed distance (20 mm.) from the line of contact of the rolls.

Definitions of Properties Measured by the Clark Paper Softness Tester

The Clark paper softness tester supposedly measures four characteristics—rigidity, rigidity factor, stiffness, and softness. These characteristics, as defined *(1)* by the designer of the instrument, are interrelated for they all depend on the measurement of the critical length for 90 degrees. These characteristics are defined by Clark as follows:

$$\text{Rigidity} = L^3W/10{,}000,$$
$$\text{Rigidity Factor} = L^3W/100\ T^3,$$
$$\text{Stiffness} = L^3/100, \text{ and}$$
$$\text{Softness} = 1{,}000{,}000 \times \log_{10}(t + 1)/L^3W,$$

where

L is the average critical length in cm.,
T is the thickness of a single sheet of paper in thousandths of an in.
t is the basic thickness of a single sheet of paper in thousandths of an in., and
W is the basis weight in g. per sq. m.

Theoretical Considerations

It is possible to relate Clark's definitions with

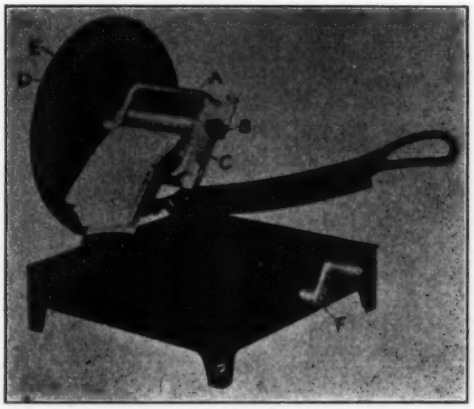

FIG. 1.
Clark Paper Softness Tester.

quantities fundamental to the theory of flexure of beams. The paper strip inserted between the rolls of the instrument is somewhat similar to a uniformly loaded cantilever supported at only one end. The load applied to the paper originates only from its own weight and is continuously distributed along the length of the strip.

Flexural rigidity of a strip of paper (or beam) is the bending moment required to produce unit curvature of bend.

The *rigidity* of a paper is its property of resisting an applied bending force, and it is determined fundamentally by the flexural rigidity per unit width of the sheet.

The following formula for the deflection of a uniformly loaded cantilever contains an expression for flexural rigidity:

$$Y = L^4w/8\ EI, \qquad (1)$$

where

Y = deflection at the end of the cantilever caused by its own weight,
w = weight per unit length of cantilever (proportional to W),
L = overhanging length, and
EI = flexural rigidity, where
E = Young's modulus, and
I = moment of inertia of section of strip.

Unfortunately the simple equations—like Equation 1—which have been developed for the bending of beams do not apply here, because they are deduced on the assumption that the change in curvature owing to stress is very small. It is needless to point out that the curvatures produced in the test strips in the Clark softness test are relatively very large. Where the curvature of bending is not negligibly small, the theory becomes very unwieldy. However, theoretical considerations suggest that, at the critical point, test samples of all stiffnesses and critical lengths will have shapes which are *geometrically similar*. Geometrical similarity was tested by taking many profile photographs of test samples adjusted to the critical point. Inasmuch as the critical lengths are greatly different, it was necessary to magnify or reduce the profiles to a common size. When this was done it was found that the shapes were approximately similar; deviations were accounted for by critical dependence of shape on length near the point of instability and by lack of uniformity of stiffness in individual test samples. If it is assumed that the shapes of all samples at the critical point are geometrically similar, then it must follow that all corresponding linear distances are proportional to some reference distance like the critical length, L. Let us consider three lengths: L, the critical length; r, the radius of curvature of the test strip at the point of support; and a, the horizontal distance from the point of support to the center of gravity of the overhanging portion of the strip. Then

$$r = k_1L, \text{ and } a = k_2L. \qquad (2)$$

The coefficients k_1 and k_2 are constant for strips of all critical lengths, on the assumption of geometrical similarity. We know that the bending moment M at the point of support is aLw (weight of strip multiplied by horizontal distance to point of support).

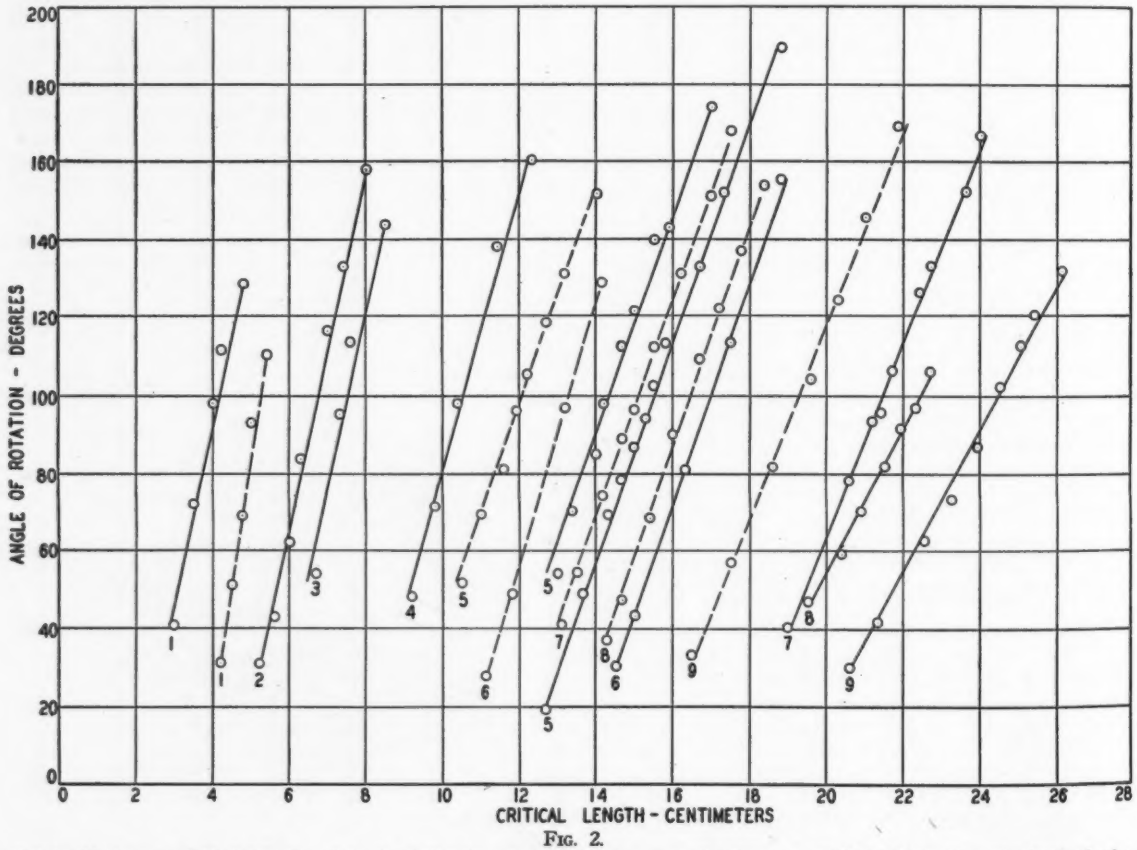

FIG. 2.

Relationship between Critical Length and Angle of Rotation. 1. Facial tissue, 2. Toilet tissue, 3. Cellophane, 4. Supercalendered glassine, 5. Manifold, 6. Waxed glassine, 7. E. F. book, 8. Sulphite bond, 9. Sulphite ledger. —— Machine Direction. --- Cross Machine Direction.

It is basic to the theory of bending that $M = EI/r$, or, substituting for M, $aLw = EI/r$. Consequently, $EI = aLwr$. Substituting in Equation 2, we obtain

$$EI = k_1 k_2 L^3 w. \quad (3)$$

Since w is proportional to W, it follows that

$$L^3W/10{,}000 = \text{Clark rigidity} = \text{constant} \times EI; \quad (4)$$

i.e., Clark rigidity is proportional to flexural rigidity.

The *rigidity factor* is a measure of the rigidity of the structure of the sheet and is a specific property of the material. It is proportional to Young's modulus.

It has been shown (*see* Equation 3) that

$$EI = k_1 k_2 L^3 w. \quad (3)$$

It is known that $I = \text{constant} \times T^3$, where T is the thickness of the sheet of paper. When this value for I is substituted in Equation 5 and when arbitrary constants are introduced,

$$L^3W/100\ T^3 = \text{Clark rigidity factor} = \text{constant} \times E. \quad (6)$$

The *stiffness* of a paper (according to Clark's definition) is its ability to support its own weight—i.e., it is the inverse of limpness. Clark stiffness is proportional to the flexural rigidity per unit of basis weight.

Rearranging Equation 4 and inserting convenient constants,

$$L^3/100 = \text{Clark stiffness} = \text{constant} \times EI/W \text{ (proportional to flexural rigidity per unit of basis weight).} \quad (7)$$

The *softness* of a paper might be defined as the ease of crumpling by hand, together with the absence of sharp edges in the crumpled sheet. The feeling of softness is governed by both the flexural rigidity of the paper and the basic thickness of the sheet (flexural rigidity being the same, a thick sheet should feel softer than a thin sheet). A logarithmic function to describe the influence of basic thickness, viz., $\log (t + 1)$, was taken by Clark in view of the fact that the senses of people in perceiving differences in sound and light vary according to a logarithmic law. This function was arbitrarily adopted in the absence of a known relationship.

$$\text{Clark softness} = 10^6 \log(t + 1)/L^3W. \quad (8)$$

Modifications in Operating Technique of the Clark Paper Softness Tester

At the beginning of a determination with this instrument, the overhanging length must be long enough to require an angle of rotation greater than 90 deg. since the portion of the strip near the clamp becomes weakened by repeated flexure. It was found that small changes in the overhanging length of the paper sample caused large changes in the angle of rotation. For this reason, it was difficult to adjust the overhanging length to give an angle of rotation of exactly 90 degrees. Whenever the strip length became less than the critical value, the sample had to be discarded, because accurate results could not be obtained otherwise.

Experiments were carried out to determine the relationship between the critical length and the corresponding angle of rotation. Each paper strip tested was inserted between the rollers so as to fall over in both directions of rotation through an angle of considerably more than 90 degrees. The overhanging length was then gradually decreased so as to require smaller angles of rotation. The angle for each measured critical length was observed. Papers ranging in weight and stiffness from facial tissue to sulphite ledger were studied.

Figure 2 gives the results obtained. It is evident that the critical lengths and the corresponding angles of rotation bear a linear relationship to each other throughout the whole range of papers studied. The slopes of the lines are great, illustrating the fact that a small change in the overhanging length is accompanied by a large change in the angle of rotation.

Since the critical length bears a straight-line relationship to the angle of rotation, the length at 90 deg. can readily be determined by measuring the critical lengths at two other angles.

The equation for a straight line passing through two known points (X_1, Y_1, and X_2, Y_2) is

$$(Y - Y_1)/(Y_2 - Y_1) = (X - X_1)/(X_2 - X_1). \quad (9)$$

When X_1 and X_2 are the observed critical lengths, Y_1 and Y_2 the corresponding observed angles of rotation, and X the critical length at $Y = 90$ deg., the following relationship is true,

$$L_{90^\circ} = [(90^\circ - \theta_1)\ (L_2 - L_1)\ /\ (\theta_2 - \theta_1)] + L_1, \quad (10)$$

where

L_{90° = critical length at 90 deg.,
L_1 = smaller observed critical length,
L_2 = larger observed critical length,
θ_1 = smaller observed angle of rotation, and
θ_2 = larger observed angle of rotation.

The use of Equation 10 not only simplified the operating technique but also permitted the use of the Clark paper softness tester for papers where a 90-deg. angle of rotation was not valid; for several very limp samples, the test specimen lay against one of the rolls over an appreciable arc. Using the modified technique and operating at smaller angles, this source of error did not enter.

It was noticed at the beginning of the study that the stray air currents present in a conditioned atmosphere seriously interfered with the determination of the end point. A cabinet was therefore constructed to enclose the instrument. This device proved invaluable, especially when lightweight samples were tested.

For most papers, specimen strips 2 in. wide were used. It was found, however, that for lightweight papers, such as facial tissues, a pronounced and undesirable curvature across the strip resulted when specimens of this width were used. Reducing the width of the strips to 1 in. was sufficient to eliminate such curvature.

The basic thickness of creped paper was determined in the following manner. Strips of the paper 15 mm. wide were cut in the machine direction. A single strip was then placed between the faces of a dial micrometer designed according to the specifications given in TAPPI Standard T 411 m-36. The paper was slowly and uniformly stretched with the fingers until it broke. The minimum micrometer reading just before the strip broke was taken as the basic thickness. However, difficulty was encountered in determining basic thickness for facial tissues by this method, because the tensile strength of such paper was so low that it prevented sufficient stretching. An arbitrary method for the determination of basic thickness of facial tissues was adopted wherein a single strip of paper, 15 mm. wide, was passed back and forth once through the rollers of the instrument. The thickness was then measured. The calendering action of the rollers was sufficient to smooth out the crepe in the sheet but was probably not great enough to reduce the thickness below the value which it would have had if the sheet had never been creped. Basic thickness determination

for towel tissues by the above two methods checked closely.

Correlation of the Clark Paper Softness Tester and the Gurley Stiffness Tester

Though the Clark paper softness tester and the Gurley stiffness tester were designed to measure similar properties of paper, the mechanics of the two instruments is different. The paper strip in the Clark instrument is similar to a beam that is fixed at one end and free at the other. The load applied to the sample originates from its own weight and is continuous along the length of the strip. The Gurley tester measures the externally applied moment required to produce a given deflection. The paper strip here becomes a beam fixed at one end and having a concentrated load applied at the other end.

Clark rigidity is an expression of the flexural rigidity of paper (see Equation 4). It is known that flexural rigidity is proportional to the bending moment required to produce a given deflection. Therefore, Clark rigidity should theoretically be proportional to Gurley stiffness.

A wide range of papers was tested on both the Clark and Gurley instruments. In each determination ten specimens were tested for each direction. The results are given in Table I.

A plot of the data, given in Fig. 3, and the ranking of samples as given in Table II, indicate that the Clark rigidity values for these papers correlate somewhat linearly with the Gurley stiffness values as normally determined. Inspection of the data in Table I shows that the correlation is unsatisfactory. In the case of two samples having the same Gurley stiffness at 90 mg., the respective Clark rigidity values were 17.2 and 36.7 rigidity units, a difference of 113 per cent; in another case, where the Clark rigidities were 0.775 and 0.671, the respective Gurley stiffnesses were 21.6 and 11.3, i.e., the percentage difference between the former pair is only 15.5 per cent, whereas in the latter case the difference is 91 per cent.

It was felt that the poor correlation might be explained, particularly in the case of limp papers, by the spurious action of the weight of the test sample in the Gurley test. Through determination of the pertinent geometrical characteristics of the Gurley stiffness tester, a simple and approximate correction formula was developed, viz.,

$$\Delta F = (W'/2) \sin (\alpha + \beta) \cos \beta.$$

In this formula, ΔF is the force in milligrams to be subtracted from the Gurley stiffness (F), W' is the weight in milligrams of the overhanging length of a test sample of standard size, α is the angle of the instrument needle with the vertical, and β is the angle between the needle and a line joining the two ends of the test strip at the moment the free end of the test strip is about to escape the vane connected to the needle. The various quantities involved in the corrections are presented in Table III. A study of the data there presented reveals that the corrections are by no means small; the values of ΔF to be subtracted from Gurley stiffness vary from 27 per cent of the instrumental stiffness for the stiffest paper (sulphite ledger) to approximately 91 per cent for the most limp paper (toilet tissue). The data of Table III for uncorrected (column F) and corrected (column $(F - \Delta F)$) Gurley stiffness are plotted against Clark rigidity in Fig. 3 (log log paper used). It will

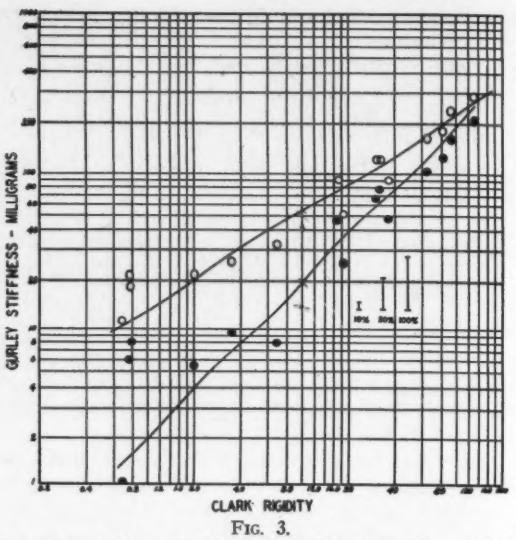

FIG. 3.

Clark Rigidity Compared with Gurley Stiffness. O—Normal Gurley Values. ●—Corrected Gurley Values.

TABLE II—CORRELATION OF RANKINGS BY CLARK PAPER SOFTNESS TESTER AND GURLEY STIFFNESS TESTER

Paper	Machine Direction: Clark rigidity ranking	Machine Direction: Gurley stiffness ranking	Cross Direction: Clark rigidity ranking	Cross Direction: Gurley stiffness ranking
Sulphite ledger	1	1	1	1
E. F. book	2	2	3	2
Sulphite bond	3	3	2	3-4*
Waxed glassine	4	4	4	3-4*
Manifold	5	5	5	5
Supercalendered glassine	6	6	6	6
Toilet tissue	7	8	7	7
Cellophane	8	7	—	—

* Equal ranking.

TABLE I—COMPARISON OF CLARK PAPER SOFTNESS TESTER AND GURLEY STIFFNESS TESTER

Paper	W g. per sq. m.	T 0.001 in.	L cm.	L^3 cm.^{3}	Clark Rigidity $L^3W/10^4$	Clark Rigidity Factor $L^3W/100\ T^3$	Clark Stiffness $L^3/100$	Gurley Stiffness mg.
Machine Direction								
Cellophane	32.5	1.1	6.2	238	0.775	58.2	2.38	21.6
Toilet tissue	21.9	2.7	7.1	358	0.784	4.16	3.58	18.5
Supercalendered glassine	33.1	1.2	10.2	1,060	3.51	203	10.6	25.5
Manifold	49.3	2.7	15.6	3,400	18.7	95.0	38.0	50.5
Waxed glassine	73.9	2.9	16.3	4,330	32.0	131	43.3	125
Sulphite bond	73.5	4.0	22.3	11,100	81.5	127	111	180
English finish book	89.5	4.2	21.8	10,400	92.7	125	104	235
Sulphite ledger	91.6	4.3	24.2	14,200	130	163	142	285
Cross Direction								
Toilet tissue	22.3	2.7	6.7	301	0.671	3.57	3.01	11.3
Supercalendered glassine	33.4	1.2	8.4	593	1.98	115	5.93	21.5
Manifold	49.1	2.7	11.2	1,410	6.90	35.1	14.0	32.2
Waxed glassine	74.7	2.9	13.2	2,300	17.2	70.5	23.0	90.0
English finish book	89.2	4.2	15.1	3,440	30.7	41.5	34.4	125
Sulphite bond	74.8	4.0	17.0	4,910	36.7	57.4	49.1	90
Sulphite ledger	92.9	4.3	19.2	7,080	65.8	82.8	70.8	165

be seen that the slope of the line for the uncorrected Gurley stiffness data is appreciably smaller than the ideal value, 1.00; if both instruments measure something directly proportional to flexural rigidity, a linear relationship should exist between the instrumental readings; on a log log plot, direct proportionality is indicated by a slope of unity. It is therefore highly significant that, after correction, the points fall more nearly about a line having a slope of unity. (The lower line was drawn with unity slope.) The scattering of the points remains bad even after correction, but good accuracy cannot be expected where the correction is so large a part of the instrumental value. Another source of error in the Gurley test is the frictional drag at the free end of the test sample; the error caused by this drag could easily account for the large percentage deviations from the lower line.

The purpose of the comparison of Gurley stiffness and Clark rigidity was to ascertain if Clark rigidity (which is theoretically proportional to flexural rigidity, EI) is actually proportional to flexural rigidity as determined by an existing stiffness tester. A study of the comparison led, as shown above, to the conclusion that *the Gurley stiffness tester is seriously in error for all papers of light and medium weight.* A comparison of Clark rigidity with flexural rigidity as determined by a research method is given later in this report.

Reproducibility of Results

The reproducibility of these tests, as indicated by percentage mean deviation, was, on the whole, about the same for the Clark paper stiffness tester and the Gurley stiffness tester (see Table IV). The cube of the critical length enters into all calculations for the Clark paper softness tester and, therefore, was used for comparative purposes. In spite of the fact that raising the observed critical lengths to the third power increases deviations about three-fold, the mean deviation for all papers tested in this group was slightly lower for the Clark instrument. Ten representative specimens in each direction were used for the papers tested on the Clark paper softness tester. Of all the papers so evaluated, an English finish book gave the most uniform results; facial tissue A was the least uniform.

TABLE IV—REPRODUCIBILITY OF RESULTS OBTAINED WITH CLARK PAPER SOFTNESS TESTER AND GURLEY STIFFNESS TESTER

		Clark Paper Softness Tester		Gurley Stiffness Tester
Paper	Direction	Mean Deviation for L per cent	Mean Deviation for L^3 per cent	Mean Deviation per cent
Cellophane	M.D.	8.1	25.7	6.2
Toilet tissue	M.D.	4.4	13.7	10.8
	C.D.	2.5	8.2	8.9
Supercalendered glassine	M.D.	2.1	6.3	9.0
	C.D.	1.2	3.9	5.6
Manifold	M.D.	4.8	14.7	9.0
	C.D.	1.6	4.8	13.9
Waxed glassine	M.D.	1.3	3.9	7.2
	C.D.	1.3	3.3	14.4
E. F. book	M.D.	0.6	1.9	6.8
	C.D.	1.1	3.1	5.6
Sulphite bond	M.D.	1.6	4.7	8.9
	C.D.	2.1	6.3	8.3
Sulphite ledger	M.D.	1.9	5.6	2.5
	C.D.	1.3	3.8	6.0
Percentage Mean deviation for all papers			7.3	8.2

TABLE V—REPRODUCIBILITY OF RESULTS

	English Finish Book		Facial Tissue A	
	Machine Direction	Cross Direction	Machine Direction	Cross Direction
Mean L for first 10 specimens	21.8	15.1	3.90	5.60
Mean L for second 10 specimens	21.7	14.9	4.09	5.18
Mean L for third 10 specimens	21.9	15.2	4.17	5.16
Mean L^3 for first 10 specimens	10,305	3,445	61	178
Mean L^3 for second 10 specimens	10,216	3,332	69	140
Mean L^3 for third 10 specimens	10,483	3,522	73	138
Mean L^3 for 30 specimens	10,335	3,433	68	152
Probable error for mean of L^3 of 30 specimens	60.9	23.8	1.04	3.38
Percentage probable error for mean of L^3 of 30 specimens	0.6	0.7	1.5	2.2
Number of specimens for 5 per cent probable error in mean of L^3	4	5	10	14

In order to study further the degree of reproducibility of the results, additional readings were taken, using thirty representative speciments in each direction for the above two papers. Table V summarizes the results obtained. For the English finish book paper, the testing of five specimens in each direction would involve a probable error of 5 per cent. However, in the case of facial tissue A, considerably more specimens would need to be tested to bring the probable error down to 5 per cent. Evidently the errors encountered in the operation of the Clark paper softness tester can be attributed mainly to the nature of the paper being tested. For the evaluation of a group of closely related lightweight papers, at least ten representative strips in each direction, and preferably fifteen, should be tested. For heavier papers that yield large uniform critical lengths, five tests in each direction may be sufficient.

Correlation of Clark Rigidity with Flexural Rigidity as Determined by a Torsion Pendulum

According to Equation 4, Clark rigidity ($L^3W/10{,}000$) is proportional to flexural rigidity (EI). In this L is the critical length in the Clark test, W is the basis weight in g. per sq. m., E is Young's modulus ("modulus of elasticity"), and I is the "moment of inertia" of the section of the test strip. It was considered important to test this theoretical relationship. One of the best means for measuring flexural rigidity is afforded by the "torsion pendulum." This device

TABLE III—CORRECTION OF GURLEY DATA FOR WEIGHT OF SPECIMEN

	Gurley Stiffness									
Paper Machine Direction	Actual Scale Reading	α	β	Basis Weight g. per sq. m.	W' mg.	ΔF mg.	F mg.	$\Delta F/F$ per cent	$(F-\Delta F)$ mg.	Clark Rigidity
Cellophane	0.43	2.5	28.6	32.5	68	15.4	21.6	71	6.2	0.775
Toilet tissue	0.37	2.1	"	21.9	46	10.3	18.5	56	8.2	0.784
Supercalendered glassine	0.51	2.9	"	33.1	70	16.1	25.5	63	9.4	3.51
Manifold	1.01	5.8	"	49.3	104	25.8	50.5	51	24.7	18.7
Waxed glassine	2.5	14.5	"	73.9	155	46.4	125	37	78.6	32.0
Sulphite bond	3.6	21.1	"	73.5	154	51.5	180	29	129	81.5
E. F. book	4.7	28.0	"	89.5	188	68.9	235	39	166	92.7
Sulphite ledger	5.7	34.7	"	91.6	192	75.6	285	27	209	130
Cross Direction										
Toilet tissue	0.225	1.3	"	22.3	47	10.3	11.3	91	1.0	0.671
Supercalendered glassine	0.43	2.5	"	33.4	70	15.9	21.5	74	5.6	1.98
Manifold	0.64	3.7	"	49.1	103	24.2	32.2	75	8.0	6.90
Waxed glassine	1.8	10.4	"	74.7	157	43.2	90.0	48	46.8	17.2
Sulphite bond	1.8	10.4	"	74.8	156	43.0	90.0	48	47.0	36.7
E. F. book	2.5	14.5	"	89.2	187	56.0	125	45	69.0	30.7
Sulphite ledger	3.3	19.3	"	92.9	195	63.5	165	39	102	65.8

is a symmetrical mass suspended from a wire; its vibration is rotational about a vertical axis coincident with the torsion wire. The period, T, of such a pendulum is determined by the moment of inertia of the suspended mass, I_o, and the restoring torque per unit angular displacement, r. If a paper strip is clamped to the suspended mass in such fashion that the strip is bent when rotation occurs, the added restoring torque caused by the bending of the strip causes a reduction in the period of rotational vibration. It develops that flexural rigidity of the strip may be computed from data on the periods T and T_o of the pendulum with and without the test strip. The arrangement used is shown schematically in Fig. 4.

The theory of the torsion pendulum results in the following formula for flexural rigidity:

$$EI = 4\pi^2 I_o [b^3/6(b + a)^2] \times [(1/T)^2 - (1/T_o)^2] . \quad (11)$$

This formula holds accurately when the amplitude of vibration is small. The distances a and b are those indicated in Fig. 4.

Using this method, the flexural rigidities of fourteen samples of paper and of a sample of cellophane were determined. The Clark rigidities of specimens of the same samples were also determined, using the modification of operating technique presented in an earlier section of this report. In every case, measurements were made on ten specimens for each sample. The data obtained are presented in Table VI and are plotted on log log paper in Fig. 5. The flexural rigidities are given in dynes cm.^{2} for a strip 1 cm. wide. It is interesting to note that the probable errors in the means are of similar magnitude in the two tests. In each test, the probable error is attributable mainly to specimen variations. The correlation indicated by Fig. 5 is good, with most points falling within about 10 per cent of the curve. It is important to note that *the curve is straight and has a slope very nearly equal to unity, indicating a direct proportionality between Clark rigidity and flexural rigidity.* From this work it is concluded that Clark rigidity differs from the fundamentally important flexural rigidity only in a constant of proportionality, and hence the Clark paper softness tester may be used to measure stiffness, when stiffness is defined as that property of paper which resists bending by externally applied forces.

According to the present work, the flexural rigidity of a strip 1 cm. wide in dynes cm.^{2} may be obtained

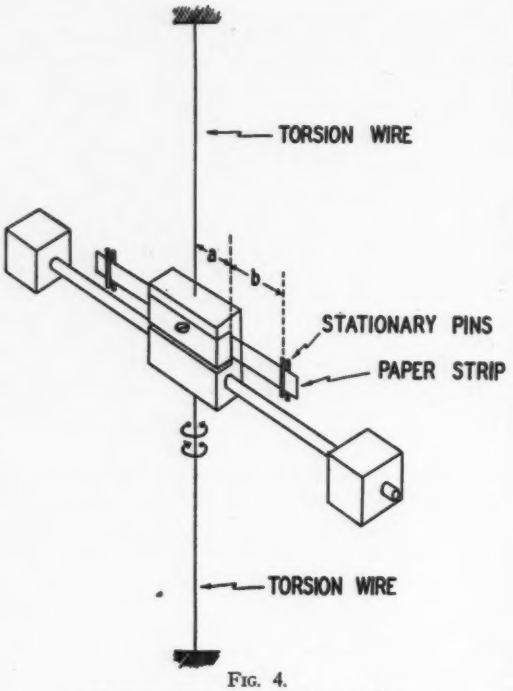

FIG. 4.
Schematic Drawing of Torsion Pendulum.

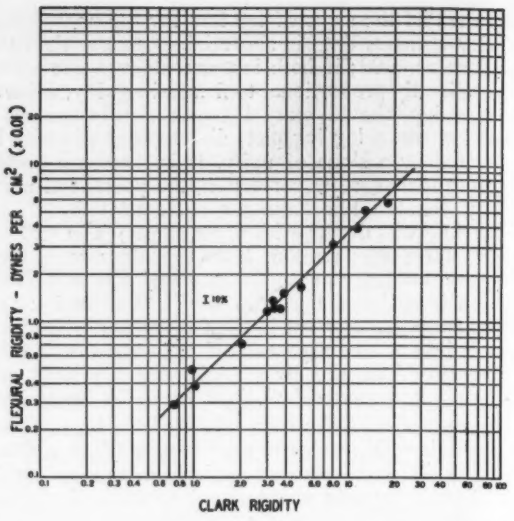

FIG. 5.
Clark Rigidity Correlated with Flexural Rigidity as Determined by Torsion Pendulum. Note—The reference distance represents the percentage deviation indicated on any part of the graph; percentage is based on the *smaller* of any two values considered.

TABLE VI—CORRELATION BETWEEN CLARK RIGIDITY AND FLEXURAL RIGIDITY

Paper	Basis (*W*) Weight g. per sq. m.	Clark Av. (*L*) Critical Length at 90 deg.	Clark Rigidity $10^{-4} W L^3$	Flexural Rigidity as determined by torsion pendulum dynes per sq. cm.	Probable Error,* Clark Rigidity per cent	Probable Error,* Flexural Rigidity per cent
Manifold	47.9	15.6	18.2	577	0.9	0.9
Glassine C	51.4	13.6	12.9	513	0.9	
Glassine D	47.2	13.4	11.4	399	1.2	1.4
Glassine F	42.3	12.4	8.07	312	0.8	3.2
Glassine A	38.8	10.9	5.02	167	2.1	2.0
Glassine B	35.7	10.3	3.90	150	0.7	2.5
Glassine G	31.8	10.5	3.68	120	2.2	2.2
Glassine E	32.9	10.0	3.29	137	2.1	1.2
Glassine I	34.8	9.7	3.18	121	1.0	2.9
Glassine H	32.8	9.7	2.99	117	2.7	2.4
Glassine I	31.5	8.7	2.07	71.9	1.3	2.7
Wrapping tissue B	18.4	8.3	1.05	38.2	2.4	1.3
Cellophane	31.5	6.8	0.992	48.1	1.4	1.9
Wrapping tissue A	17.2	7.7	0.785	29.3	2.3	2.8
Toilet tissue	22.3	7.0	0.765	29.3	2.5	1.4
				Average:	1.6	2.0

All samples tested in machine direction.
* Probable errors were computed from errors in L^3 and in T^3, respectively. In each case, the rigidity given is the mean of ten determinations, and the probable error relates to the mean.

from Clark rigidity by means of the relation, $EI = 37.6\ (L^3W/10{,}000)$. Occasional errors in EI greater than 10 per cent may be expected.

If the errors in other stiffness testers involving both externally applied forces and weight of sample are of the order of those obtained in the Gurley stiffness tester, it may be concluded that the Clark paper softness tester affords a more valid measure of stiffness than do the usual testers.

Correlation of Clark Softness With Subjective Ranking

Evaluation of Facial Tissues. A group of ten facial tissues was tested in both machine and cross machine directions on the Clark paper softness tester (see Table VII). Ten readings were taken for each determination. From this group, six samples that showed reasonable differences in softness values were chosen for subjective tests. Softness was clearly defined to each of fifteen men and women who participated in these tests. The subjects were instructed to crumple the test tissues, one in each hand, and to determine the softer of the two thus crumpled. This comparative crumpling continued until every possible combination of two facial tissues was judged and until all six were ranked according to softness.

Table VIII presents the results obtained for the subjective correlation. It was found that the best correlation existed between the subjective ranking and the mean of the machine direction and the cross machine direction softness values. This is reasonable since, in the subjective tests, the sheets were crumpled in both directions. The disagreement between the subjective tests and the mean Clark softness values in ranking facial tissue C probably was due to the fact that sample C was the thinnest and lightest of the tissues, even though it was not the softest.

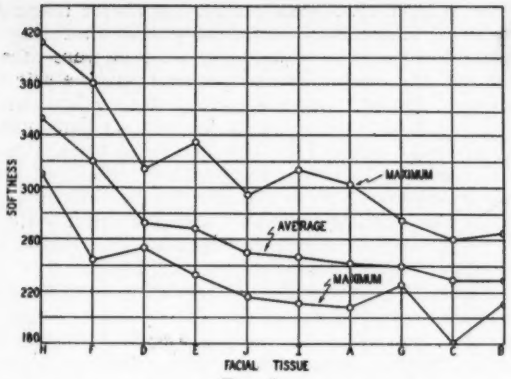

FIG. 6.
Variation in Clark Softness Readings for Facial Tissues.

Figure 6 illustrates the spread in individual softness readings for each of the ten facial tissues tested on the Clark paper softness tester. The individual softness values for all ten samples overlapped and there were relatively small differences among the average readings. The necessity for the evaluation of a sufficient number of representative specimens was indicated.

Evaluation of Towel Tissues. A series of nine towel tissues was tested in both machine and cross machine directions on the Clark paper softness tester

TABLE VII. EVALUATION OF FACIAL TISSUES

Facial Tissue	L cm.	W g. per sq. m.	t .001 in.	T .001 in.	Softness $10^6 \log (t+1)/L^3W$	Rigidity $L^3W/10{,}000$	Rigidity Factor $L^3W/100\ T^3$	Stiffness $L^3/100$
			Machine Direction					
A	3.9	17.2	1.34	2.72	362	0.102	0.507	0.593
B	3.9	18.6	1.44	2.65	351	0.110	0.590	0.593
C	3.9	16.7	1.23	2.04	352	0.0991	1.16	0.593
D	4.1	16.9	1.30	2.24	311	0.116	1.04	0.689
E	3.9	18.2	1.56	2.49	378	0.108	0.695	0.593
F	3.5	16.5	1.27	2.54	504	0.0707	0.435	0.429
G	4.2	18.3	1.45	2.20	288	0.136	1.27	0.741
H	3.8	16.1	1.34	2.96	418	0.0883	0.341	0.549
I	3.9	17.9	1.47	2.55	370	0.106	0.975	0.593
J	3.8	20.3	1.55	2.77	365	0.111	0.523	0.549
			Cross Direction					
A	5.6	17.2	1.34	2.72	122	0.302	1.50	1.76
B	5.8	18.6	1.44	2.65	107	0.363	1.95	1.95
C	5.8	16.7	1.23	2.04	107	0.326	3.84	1.95
D	4.5	16.9	1.30	2.24	235	0.154	1.37	0.911
E	5.2	18.2	1.56	2.49	160	0.256	1.65	1.41
F	5.4	16.5	1.27	2.54	137	0.260	1.60	1.57
G	4.8	18.3	1.45	2.20	192	0.202	1.90	1.11
H	4.3	16.1	1.34	2.96	289	0.128	0.495	0.795
I	5.6	17.9	1.47	2.55	125	0.314	1.90	1.76
J	5.3	20.3	1.55	2.77	135	0.302	1.42	1.49

TABLE VIII.—CORRELATION BETWEEN CLARK SOFTNESS AND SUBJECTIVE TESTS FOR FACIAL TISSUES

Facial Tissue	Clark Softness: Ranking	Clark Softness: Mean of M.D. and C.D. Softness Values	Ranking by Subjective Softness Tests: 1-A	1-B	2-A	2-B	3-A	3-B	4	5	6	7	8	9	10	11	12	13	14	15	Av.	Ranking of group
H	1	354	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1
F	2	321	3	2	3	3	5	2	3	3	2	2	2	2	2	2	2	2	2	2	2.4	2
E	3	269	6	6	4	4	6	5	5	4	6	4	4	4	5	3	4	4	3	5	4.6	5
J	4	250	4	4	5	6	3	4	4	6	5	3	3	3	6	4	3	3	4	4	4.1	4
G	5	240	5	5	6	5	4	6	6	2	4	6	6	6	4	6	5	5	5	6	5.1	6
C	6	230	2	3	2	2	1	3	2	5	3	5	5	5	3	5	6	6	6	3	3.7	3

	Clark Rating	Subjective Rating
1	H	H
2	F	F
3	E	C
4	J	J
5	G	E
6	C	G

(see Table IX). Again, ten readings were taken for each determination. Six towel tissues that showed reasonable differences in softness values were chosen for subjective tests. The subjective technique was the same as that used for the facial tissue evaluation.

Table X shows the definite correlation that existed between the subjective ranking of the towel tissues and the Clark softness values. It is significant that, for these samples as well as for the facial tissues, the subjective ranking correlates with the mean softness values instead of either the machine direction or the cross machine direction softness values.

Figure 7 demonstrates the variation in individual softness values obtained for the nine towel tissues and the consequent necessity for testing at least ten representative specimens in each direction when a group of closely related papers is evaluated.

Evaluation of Waxing Glassines and Waxed Wrappers: Softness, or ease of folding, is an important use requirement property of glassines and waxed papers employed as wrappers for products such as bread, cheese, soap, etc. In general, as the softness increases, the tendency of the sheet to pull apart any seals present in the wrapper disappears. Wrappers of a wide range of softness are used. However, when the softness becomes too pronounced, the wrapper does not hold its shape properly, loses much of its value in creating a pleasant psychological impression; and presents difficulties in cutting and trimming. The relative softness at present is commonly estimated by crumpling the sheet in the hand.

Several waxing glassines and waxed bread wrappers were tested for softness on the Clark tester and were also evaluated subjectively, employing the same technique as that used for the facial and towel tissues. In the calculation of the softness values for the glassines and waxed papers, however, the actual thickness was used instead of basic thickness. Although only a few samples were evaluated, the results showed that, as for the facial and towel tissues, the Clark values are definite indications of softness (see Tables XI and XII).

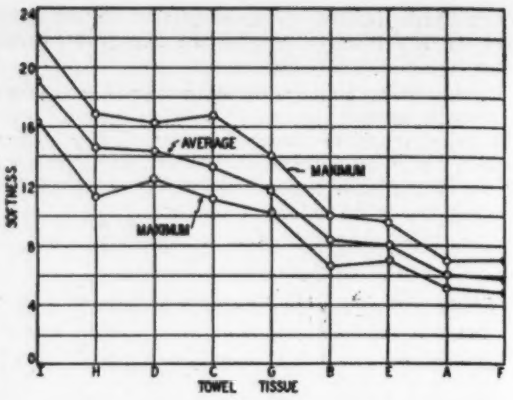

FIG. 7.
Variation in Clark Softness Readings for Towel Tissues.

Conclusions

The operation of the Clark paper softness tester is inconvenient and, in some cases, leads to error when the critical angle is inflexibly maintained at 90 degrees. If, however, a suggested modification of the technique is used, these objections are removed.

Clark rigidity and Gurley stiffness show a poor correlation for a series of papers representing a wide variation in stiffness.

The Gurley stiffness tester is seriously in error;

TABLE IX—EVALUATION OF TOWEL TISSUES

Towel Tissue	L cm.	W g. per sq. m.	t .001 in.	T .001 in.	Softness $10^6 \log (t+1)/L^2W$	Rigidity $L^2W/10^4$	Stiffness $L^2/100$
			Machine Direction				
A	13.7	44.8	6.4	8.3	7.54	11.5	25.7
B	12.4	61.1	6.3	7.9	7.41	11.7	19.1
C	11.2	45.4	4.7	6.8	11.8	6.37	14.1
D	7.9	67.8	5.9	8.6	25.1	3.34	4.93
E	10.9	48.8	4.9	8.1	12.1	6.33	13.0
F	12.1	52.5	6.6	12.6	9.46	9.31	17.7
G	10.1	41.7	4.7	8.4	17.5	4.29	10.3
H	9.2	44.1	4.9	8.8	22.5	3.43	7.79
I	8.1	41.2	4.1	8.4	32.3	2.18	5.31
			Cross Direction				
A	16.5	44.8	6.4	8.3	4.31	20.0	44.9
B	11.5	61.1	6.3	7.9	9.31	9.28	15.2
C	10.4	45.4	4.7	6.8	14.7	5.11	11.3
D	15.0	67.8	5.9	8.6	3.66	22.9	33.8
E	15.7	48.8	4.9	8.1	4.07	18.9	38.7
F	20.0	52.5	6.6	12.6	2.10	42.0	80.0
G	14.4	41.7	4.7	8.4	6.04	12.5	29.9
H	13.8	44.1	4.9	8.8	6.64	11.6	26.3
I	14.3	41.2	4.1	8.4	5.84	12.1	29.2

TABLE X.—CORRELATION BETWEEN CLARK SOFTNESS AND SUBJECTIVE TESTS FOR TOWEL TISSUES

Towel Tissue	Clark Softness: Ranking	Clark Softness: Mean of M.D. and C.D. Softness Values	Ranking by Subjective Softness Tests: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Av.
I	1	19.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0
H	2	14.6	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2.1
C	3	13.3	3	3	3	4	4	2	3	3	3	3	4	3	3	3	4	3.2
G	4	11.8	4	4	4	3	3	3	5	5	4	4	3	4	4	4	3	3.8
E	5	8.1	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	4.9
F	6	5.8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6.0

	Clark Rating	Subjective Rating
1	I	I
2	H	H
3	C	C
4	G	G
5	E	E
6	F	F

tor papers of light and medium weight the error may be as high as 90 per cent of the apparent stiffness value.

Clark rigidity is directly proportional to flexural rigidity as determined by a research method. The Clark paper softness tester probably affords a more valid measure of stiffness of paper than instruments whose methods involve both externally applied forces and the weight of the test specimen.

The error in instrumental data obtained with the Clark paper softness tester is due largely to sample variations, although the accuracy of the method may be limited to the order of five or ten per cent.

TABLE XI.—EVALUATION OF WAXING GLASSINES AND WAXED BREAD WRAPPERS

Paper	Basis weight g. per sq. m.	Caliper .001 in.	L (cm.) Machine direction	L (cm.) Cross direction	Softness Machine direction	Softness Cross direction	Mean Softness
Waxing glassine A	33.0	1.17	10.3	7.8	9.33	21.5	15.4
Waxing glassine B	35.5	1.12	10.5	8.0	7.94	18.0	13.0
Waxing glassine C	34.1	1.01	10.2	8.3	8.38	15.6	12.0
Waxed bread wrapper D	61.4	2.85	12.9	11.2	4.44	6.79	5.62
Waxed bread wrapper E	61.4	2.72	12.4	10.7	4.87	7.58	6.23
Waxed bread wrapper F	74.9	2.71	16.3	13.2	1.75	3.32	2.54

TABLE XII.—CORRELATION BETWEEN CLARK SOFTNESS AND SUBJECTIVE TESTS FOR WAXING GLASSINES AND WAXED BREAD WRAPPERS

	Clark Softness		Ranking by Subjective Softness Tests									
Sample	Mean of M.D. and C.D. Softness values	Ranking	1	2	3	4	5	6	7	8	Mean ranking	Comparative ranking
			Waxing Glassine									
A	15.4	1	1	1	1	1	2	1	1	1	1.1	1
B	13.0	2	2	2	2.5*	2	1	2	2	2	1.9	2
C	12.0	3	3	3	2.5*	3	3	3	3	3	2.9	3
			Waxed Bread Wrapper									
E	6.23	1	2	2	2	2	1.5*	1	1	1	1.56	2
D	5.62	2	1	1	1	1	1.5*	2	2	2	1.44	1
F	2.54	3	3	3	3	3	3	3	3	3	3.00	3

* Equal ranking.

The computed values of Clark softness correlate fairly well with subjective estimates of softness (as determined by crumpling in hand) for facial and towel tissues and for glassines and waxed papers.

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The Solubility of Beta-Cellulose in Aqueous Solutions of Inorganic and Organic Compounds

By J. R. Katz[1] and J. Seiberlich[2]

Abstract

The influence of lyotropic substances and related organic compounds on starch and their reactions with starch have been investigated by J. R. Katz (1). These substances increase the solubility and the ability to swell and decrease the gelatinization temperature of starch. Whereas, these lyotropic compounds have marked effects on starch, they were used in this investigation to produce analogous effects on cellulose. Since, as one might expect, the structure of native cellulose offers greater resistance to the effects of neutral salt solutions of the lyotropic series, a polymerized cellulose is preferably used for the experiments described below.

A depolymerized cellulose is easily obtained by allowing the cellulose to stand for several days in a 18 per cent solution of sodium hydroxide, used for preparing alkali-cellulose. The so-called β-cellulose slowly precipitates from its colloidal solution and can easily be separated by means of decantation and filtration. The precipitation of the β-cellulose may be improved by neutralization of the steeping caustic with dilutes acids. The separated β-cellulose is then washed with water until all salts have been completely removed. Drying the β-cellulose obtained, cannot be recommended, because on drying it readily becomes horny and, therefore less suitable for the present purpose of determining its solubility. It is better to keep the β-cellulose wet with water or alcohol, and determine the moisture content of each sample used.

Since the properties of β-cellulose depend upon the raw material as well as on the steeping conditions (time and temperature), it is necessary to keep enough of the same product in storage so that the figures obtained may be compared. Such a product is almost homogeneous, since experiments, three times repeated, always give the same figures.

Experimental

For each of the following experiments, 145.5 mg. of waterwet β-cellulose (corresponding to 100 mg. of moisture-free material) were used and mixed with 10 cc. of the aqueous solution of the compound to be tested. The concentration used here is mentioned later in this article. The mixture was kept boiling for 30 min. under a reflux condenser. Some of the substances used showed great sensitiveness to the oxygen of the air. To eliminate this influence, the mixture was heated in a sealed glass tube, filled with nitrogen, for 30 min. at 100 deg. C. After boiling or heating the mixture was separated by means of filtration from the undissolved part of the β-cellulose; the dissolved part in the filtrate was precipitated with an excess of 96 per cent alcohol and after filtration was dried and weighed.

In preliminary experiments, all compounds were investigated in 10 per cent solutions. However, the re-

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sults obtained by this method could not be compared with each other. Therefore, in the latter experiments, the inorganic salts were used in solutions with a concentration of 2 *N* and the organic compounds were used in normal or practically normal solutions. Table I gives the figures for the solubility of β-cellulose in inorganic salt solutions, and Table II gives the figures for organic lyotropic substances. The figures represent the amount of β-cellulose in milligrams dissolved by 10 cc. of the aqueous solution of the compound. The *p*H was regulated during all experiments. It was kept constant at 6.7. All acids were used in the form of sodium salts.

INORGANIC LYOTROPIC COMPOUNDS.

The order of effectiveness of the anions in the lyotropic series is again demonstrated here. However, it can be seen that thiocyanate and iodide exchange places in some cases.

$$I \rightarrow CNS \rightarrow NO_3 \rightarrow Br \rightarrow Cl \rightarrow F$$

The order of effectiveness of cations can be shown to be as follows:

$$Li \rightarrow Na \rightarrow K$$

From Table I it may be seen also that the order of the anion series and of the cation series are mutually independent, and that the influence of anions, as might be expected, is much stronger than the influence of the cations.

The dissolving power seems to increase with increasing size of the anion and decrease with increasing size of the cation.

TABLE I.—SOLUBILITY OF β-CELLULOSE IN INORGANIC LYOTROPIC SUBSTANCES

	Li	Na	K
F	0.5	0.2	0.0
Cl	14.1	8.0	6.0
Br	38.2	32.2	26.0
NO_3	40.2	34.1	27.3
CNS	64.2	54.3	42.2
I	85.2	77.5	63.2

TABLE II.—SOLUBILITY OF β-CELLULOSE IN INORGANIC LYOTROPIC SUBSTANCES
(Concentration = 1 normal)

	Amount of β-cellulose dissolved
Urea	25.0
Thiourea	42.2
Sodium acetate	14.2
Sodium thioacetate	30.1
Sodium glycolate	8.2
Sodium thioglycolate	58.3
Sodium chloroacetate	41.2
Sodium bromoacetate	46.8
Sodium iodoacetate	59.1
Ethyl alcohol	0.0
Chloroethyl alcohol	34.5
Bromoethyl alcohol	40.1
Iodoethyl alcohol	52.3
Acetone	0.0
Chloroacetone	0.0
Sodium dichloroacetate	48.2
Sodium trichloroacetate	60.2
Acetaldehyde	2.2
Chloralhydrate	16.0
Bromalhydrate	30.2
Sodium butyrate	16.4
Sodium heptylate	17.1
Sodium crotonate	49.9
Sodium benzoate	20.0
Sodium phenylpropionate	24.5
Sodium cinnamate	31.2
Sodium benzenesulphonate	60.1
Sodium p-toluenesulphonate	64.1
Sodium alpha naphtalene sulphonate	70.2
Sodium beta naphtalene sulphonate	68.1
Sodium ethylsulphonate	20.5
Sodium butylsulphonate	30.2
Sodium heptylsulphonate	69.2
Sodium p-oxybenzoate	20.0
Phenol	16.8
Resorcinol	34.2
Pyrogallol	39.3
Phloroglucinol	18.6
Sodium tricarballylate	0.0
Sodium succinate	1.5
Sodium citrate	0.0
Glucose	1.8
Glycol	0.0
Glycerine	0.0

ORGANIC LYOTROPIC COMPOUNDS.

As may be seen from Table II, the solubility of β-cellulose in organic lyotropic substances follows the same rules that were shown by J. R. Katz *(1)* for starch.

Conclusions

Sulphur containing compounds affect the solubility to a greater extent than the corresponding oxygen compounds.

The dissolving power of halogen compounds increases with the atomic weight of the halogen atom present. Therefore, the order of effectiveness is:

$$I \rightarrow Br \rightarrow Cl.$$

It was also found that the dissolving power of a compound increases with the number of halogen present.

The dissolving power of organic lyotropic compounds is improved by increasing the length of the chain of the molecules.

The introduction of several hydrophobic groups into the molecule decreases the dissolving power of the compound.

Sulphur and the halogens possess very little affinity for water. Organic sulphur and halogen compounds are almost insoluble in water as long as they do not carry a secondary polar group which has a greater affinity for water. These substances, repelled by the water, are absorbed by the cellulose. The hydrophilic groups are oriented towards the water layer. The order of effectiveness of the lyotropic series $I \rightarrow Br \rightarrow Cl$ is followed by these compounds. The more halogen atoms present in a molecule, the higher the specific absorption of these molecules by the cellulose and the greater the tendency to combine water. As may be seen from Table II, thiourea possesses a greater effect than simple urea (calculated on equimolar concentration). However, thiourea shows a lower solubility in water than urea. This fact is well explained by the specific absorption.

Another factor might be also of importance: the absorption of the sulphur or halogen atoms might be caused by the power of attraction of the residual valences of the cellulose. It can be clearly proved by experiment that the longer and heavier the hydrocarbon residue is, or the more double linkages present in the molecule, the greater the absorption will be and, therefore, the greater the influence of the hydrophilic effect.

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(1) Katz, J. R. *Biochem. Z.* 257 (1933), contribution 1-15, p. 385 ff.

Instrumentation in Industry

J. E. Errickson, secretary Power Maintenance Association, 418 Federal street, Camden, N. J., announces that a three-day conference and exhibition will be sponsored by the Power Maintenance Association of South Jersey, to bring to industry in the Philadelphia, Trenton, Camden and South Jersey area an exhibit to show the proper use of instruments to enable industry to minimize production, process and operating costs. All leading instrument manufacturers will participate and exhibit their newest refinements of instruments for industrial application. The exhibit will be held March 12, 13, and 14, 1940, in the gymnasium of the Camden County Vocational School, Camden, New Jersey.

Review Of Paper Industry Literature

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

Cellulose

Carbohydrates. XI. The Method of Reaction of Cellulose with Alkali. Th. Lieser, L. Henrich, and F. Fichtner. Ann. 538, no. 2:99-109 (May 4, 1939).—Cotton linters, treated with 5 *N* sodium hydroxide, part of the excess alkali removed by pressing and the remainder by washing repeatedly with isopropyl alcohol, gives a product with 27-28 per cent sodium hydroxide, corresponding to the formula $2C_6H_{10}O_5 \cdot 3NaOH$. If ethyl alcohol or propyl alcohol is used for washing, the product contains 12.9 or 19.8 per cent of alkali, corresponding to $2C_6H_{10}O_5 \cdot NaOH$ or $2C_6H_{10}O_5 \cdot 2NaOH$, respectively. The difference in alkali content is attributed to the greater hydrolyzing action of the various alcohols, this action decreasing in the order water, ethyl, propyl, and isopropyl alcohols. Similar results are obtained with potassium, lithium, and cesium hydroxides.—C.J.W.

Carbohydrates. XII. The Method of Reaction of Cellulose Dissolved in Cuprammonium Hydroxide. Th. Lieser and Hans Swiatowski. Ann. 538, no. 2:110-119 (May 4, 1939).—Cellulose, dissolved in a cuprammonium hydroxide solution and treated with sodium hydroxide, gives a precipitate which, washed with alkali and then with isopropyl alcohol, analyzes approximately as $C_6H_{10}O_5[C_6H_{10}O_5 \cdot 3/2\ Cu(OH)_2 \cdot 3NaOH]$; less sodium hydroxide is present if the product is washed with ethyl alcohol. Less variation in the analytical results is obtained by the use of barium hydroxide and the product contains 3/2 $Ba(OH)_2$. Similar results were obtained by starting with so-called cupra-cellulose, i.e., $C_6H_{10}O_5 \cdot C_6H_7O_2(OH)_3 \cdot 3/2Cu(OH)_2$. Possible mechanisms of the formation of these compounds are discussed, with special reference to the rôle of the micellar surface.—C.J.W.

The Behavior of Cellulose in Alkali Solutions. Gi-Iti Saito. Kolloid-Beiheft 49, no. 9-12:365-454 (March 27, 1939); B. I. P. C. 9:429.—The action of lithium, sodium, and potassium hydroxides on cellulose regenerated from viscose and cuprammonium solutions, as well as on native cellulose in ramie and cotton fibers, is studied by determination of the swelling phenomena of individual fibers and by estimation of the amount of alkali taken up. The fibers show a sharp maximum in swelling at some intermediate concentration (about 100 g. sodium hydroxide per liter); they swell more readily at lower temperatures, and the maximum swelling takes place at lower alkali concentration at low temperature. The alkali sorption curves begin to level off at the alkali concentrations shown to give maximum swelling. A detailed analysis of the titration data leads the author to the conclusion that more alkali is sorbed at lower temperatures, from lithium hydroxide, by the regenerated cellulose. While the data provide little definite support, it is believed that addition compounds are formed in the more concentrated solutions.—C.J.W.

Studies in Cellulose: Moisture Phenomena. O. Maass and W. Boyd Campbell. Pulp Paper Mag. Can. 40:108-114 (Conv. No., 1939).—Cellulosic fiber is considered to consist of a network of branching crystals with many "faults" or open spaces between the elements; the essential point of the concept is that the crystalline nature of cellulose lies in the regular spacing of the C_6 groups rather than in the arrangement of the long molecules, though some degree of regularity in the arrangement of the chains must follow. Results of experiments on the sorption of water and organic liquids by cellulose, heat of wetting, density or specific volume, dielectric constant and specific heat of cellulose, are discussed and explained in the light of the above concept of cellulose structure.—A.P.-C.

Constitution of the Crystalline Part of Cellulose. VII. Regenerated Celluloses. Kurt H. Meyer, Lore Misch and N. P. Badenhuizen. Helv. Chim. Acta 22, no. 1:59-65 (Feb. 1, 1939); B. I. P. C. 9:324—The authors discuss by means of x-ray investigations the form and arrangement of the chains in the various modifications of cellulose, their stability, the formation of hydrate cellulose and the decomposition of various alkali celluloses. —C.J.W.

Crystal Arrangement and Swelling Properties of Fibers and Ray Cells in Basswood Holocellulose. Geo. J. Ritter and R. L. Mitchell. Paper Trade J. 108, No. 6:33-37 (Feb. 9, 1939).—In basswood holocellulose the ray cells affect polarized light differently than do the fibers. The vibration plane for the slow-light component of the polarized light is lengthwise in basswood fiber (the same as the long axis of the fiber crystallites); it is arranged crosswise in the ray cells and the crystal arrangement is also crosswise in the ray cells. The crystal arrangement shows a definite relation to the longitudinal and the tangential swelling properties of the fibers.—A.P.-C.

Composition of Holocellulose, Hydrolyzed Holocellulose and Cross and Bevan Cellulose. Wm. G. Van Beckum and Geo. J. Ritter. Paper Trade J. 108, No. 7:27-29 (Feb. 16, 1939).—Experimental data show the distribution of some wood constituents and substituent groups in holocellulose. Some contrasts observed during the pentosan determination suggest a difference between the stability, to hydrochloric acid, of the hemicellulosic portion of some woods and the corresponding holocelluloses.—A.P.-C.

Macromolecular Compounds. 207. The Polymerization Degree of Cellulose in Old Tissues. H. Staudinger and F. Reinecke. Melliand Textilber. 20, no. 2:109-110 (Feb., 1939); B. I. P. C. 9:339.—Old tissues and papers, not less than approximately 1000 years old, were tested for their mean polymerization degrees. No cellulose with less than 200 was found, because when the value falls below 200, the celluloses are degraded to such an extent that they crumble to dust. The highest mean value amounted to about 500 for an old cotton bandage. Cellulose, however, is resistant only to the oxygen of dry air; when moisture is present, the decay is much faster. But even in the degraded state, cellulose is not chemically changed.

All the old celluloses from either paper or tissues could still be converted to nitrocellulose. The present investigations confirm the previously obtained result that cellulose with a polymerization degree of less than 200 loses its characteristic property of forming fibers.—C.J.W.

Macromolecular Compounds. 208. The Solubility of Celluloses in Alkaline Liquors. H. Staudinger and I. Jurisch. Kunstseide 21, no. 1:6-9 (Jan., 1939); B. I. P. C. 9:339.—The solubility of cellulose in alkaline liquors depends to a great extent upon its polymerization degree; only degraded celluloses are soluble, whereas cotton is mercerized on treatment with alkali. Alpha-celluloses which are insoluble on treatment with 17.5 per cent sodium hydroxide have a mean polymerization degree of about 150 and higher, beta-celluloses of 10-150, and gamma-celluloses below 10. When trying to mercerize staple fiber and rayon, experience has been that a larger or smaller percentage of the artificial fiber dissolves, whereas the natural fiber is nearly completely insoluble. The following explanation is given. Artificial fibers are built up from very degraded celluloses with polymerization degrees between 250 and 400, whereas in the natural fibers this value lies above 2000. Reprecipitated celluloses are soluble at much higher polymerization degrees than natural fibers. —C.J.W.

Critical Remarks on the Alpha-Cellulose Determination by Vieweg (Sodium Chloride Method). Steudte. Kunstseide 21, no. 4:122 (April, 1939); B. I. P. C. 9:444-445.— Vieweg suggested the use of saturated sodium chloride solution in place of 8 per cent sodium hydroxide for washing the pulp in the alpha-cellulose determination. The objection has been made that the higher alpha values obtained with Vieweg's method are based on the fibers absorbing sodium chloride, so that higher ash values result. In the present study the ash content of commercial rayon pulps was checked by two different methods, all results being negative. It was found preferable, although not absolutely essential, to use chemically pure sodium chloride for the determinations.—C.J.W.

Viscosity of Cellulose in Phosphoric Acid Solutions. Alfred J. Stamm and Wilby E. Cohen. J. Phys. Chem. 42:921-933 (1938)—Cellulose can be completely dissolved in concentrated phosphoric acid to form dilute solutions void of microscopically visible particles if the cellulose is first swollen in water and the acid concentration built up gradually. The molecular weights of a highly beaten pulp and of unbeaten pulp, calculated from the viscosities of the solutions by the Staudinger relation, were 100,000. The value for cotton linters alpha-cellulose was 113,000. Hydrolysis constants for cellulose phosphoric acid were found to reach a steady value after 4 hrs., averaging 7.05 x 10^{-6} for the pulp and 5.68 x 10^{-6} for the alpha-cellulose.—A.P.-C.

A Test of the Alternate Structure Proposed for Cellulose. S. T. Gross and G. L. Clark. Textile Research 9:7-15 (1938).—A number of oriental cellulose materials have been investigated to determine whether the unit cell for cellulose proposed by Sauter is more consistent with the x-ray evidence than that originally postulated by Meyer and Mark. Discussion of the patterns lead to the opinion that either (a) the Sauter cell cannot explain the majority of these patterns and must, therefore, be incorrect, or (b) there may be more than one type of cellulose material.—A.P.-C.

Oxycellulose. A New Reaction of Hydrocellulose. (Oxycellulose. I and II). Fritz Müller. Helv. Chim. Acta 22, no. 1:208-216, 217-224 (Feb. 1, 1939); B. I. P. C. 9:288.—Contrary to Hess' opinion it is found that oxycellulose contains carbonyl groups which give all the typical reactions of keto or aldehyde groups. Oxycellulose forms an oxycellulose-sulfurous acid addition compound, which is stable in cold water and which reacts with auric chloride with formation of Cassius Gold Purple. This reaction can be used for the detection of oxycellulose and, as hydrocellulose does not give these reactions, it can therefore be used to differentiate between oxycellulose and hydrocellulose. A specific reaction is developed in which oxidized cellulose is coupled with hydrazinonaphtholsulfonic acids followed by a reaction with diazo compounds. These reactions prove the existence of small amounts of oxidation products of cellulose containing carbonyl groups. Hydrocellulose does not contain carbonyl groups, which is in agreement with Hess' opinion.—C.J.W.

Oxy- and Hydrocellulose. III. Fritz Müller. Helv. Chim. Acta 22, no. 2:376-381 (March 15, 1939); B. I. P. C. 9:390.—Further proof is given of the presence of CO groups in oxycellulose, using various kinds of samples. The test for oxy- and hydrocellulose with Fehling's solution has been modified by treating the sample, after the reaction with Fehling's solution, with dilute acetic acid and water and placing it in a weak solution of silver nitrate or gold chloride, whereupon the red cuprous oxide is replaced by black silver oxide or Cassius Gold Purple.—C.J.W.

Alpha-Cellulose. F. G. Burvasser. Akad. Nauk. U.R.S.R., Inst. Khem Tekh (Kiev) 1938. 76 p. C. A. 33:3141.—All known methods for the determination of alpha-cellulose are described and critically compared. New gravimetric and volumetric methods are proposed.—C.J.W.

Studies of Cellulose Hydrolysis by Means of Ethyl Mercaptan. III. M. L. Wolfrom and John C. Sowden. J. Am. Chem. Soc. 60:3009-3013 (Dec., 1938).—High-viscosity cotton linters were hydrolyzed with fuming hydrochloric acid at 0°C. in the presence of an excess of ethyl mercaptan. The resulting mixtures of mercaptalated hydrolyzed celluloses were isolated at various time intervals during the first 8.5 hrs. of the hydrolysis. Corresponding non-mercaptalated hydrolyzed celluloses were prepared under exactly similar conditions, except that the ethyl mercaptan was omitted. Sulphur analytical data indicated that the average degree of polymerization of the mercaptalated products varied from 190 glucose units after 270 mins. to approximately 100 units after 510 min. The degree of polymerization calculated according to the formula of Kraemer and Lansing, from the cuprammonium viscosity data for the corresponding non-mercaptalated hydrolyzed celluloses were consistently higher than those calculated from the sulphur analytical data, and varied from 260 glucose units after 270 mins. to 174 units after 510 mins. The mercaptalated hydrolyzed celluloses showed low but definite copper numbers, varying from 0.5 to 1.3. The non-mercaptalated celluloses

had copper numbers increasing in value with increasing time of hydrolysis, and ranging from 5.3 to 8-1. —A.P.-C.

The Mode of Union in Cellulose. H. Mark. Wochbl, Papierfabr. 69, No. 49: 1931-34 (Dec. 3, 1938).—The author first discusses the chain molecule of cellulose, the length of the chain and chain mechanism. **A table is given** containing the molecular weight, degree of polymerisation, the length of the molecule and its diameter, of cellulose from cotton and all its important related substances, such as, alpha-cellulose, nitrocellulose, cellulose acetate, ethyl and methyl celluloses, and polystyren. The article then discusses native joining together or bridging together of chains or groups, and man-made combinations, such as the result of treating paper with sulphuric acid or zinc chloride, bleaching with chlorine at high temperatures, etc. The article **gives a clear insight** into the reaction taking place when cellulose undergoes treatment. —J.F.O.

Alpha, Beta and Gamma-Cellulose in Paper. Anon. Paper Trade J. 108, No. 18: 31-33 (May 4, 1939).—Revised text of the TAPPI standard method T429m-39, presented for suggestions and criticisms.—A.P.-C.

Determination of Carboxyl Groups in Various Kinds of Cellulose. L. Brissaud. Mem. Poudres 28: 43-53 (1938).—Samples after removal of ash were tested by (a) decomposition by heat in presence of hydrochloric acid (specific gravity 1.06) with measurement of evolved carbon dioxide, (b) titration with an alkaline solution, (c) double decomposition with a weak salt, such as acetate, or fixation of methylene blue. There was no quantitative agreement between the results owing to the effect of metallic impurities. Calculated as glycuronic acid, the presence of carboxyl was indicated in all the varieties of cellulose. Carboxyl has an energetic attraction for metallic bases (barium or lead oxide) and therefore to a considerable extent controls the ash content of cellulose.—A.P.-C.

Lignin

Native Lignin. F. E. Brauns. Paper Trade J. 108, No. 1: 42 (Jan. 5, 1939).—By organic solvent extraction without any acidic or basic reagent, part of the lignin was extracted from black spruce in its native form. Though the isolated native lignin represents only a relatively small percentage of the total lignin in the spruce wood, it appears to have the same chemical structure and properties as the total lignin.

The Structure of Lignin. A. B. Cramer, M. J. Hunter and Harold Hibbert. J.Am.Chem.Soc. 60: 2813 (Nov., 1938).—The new aromatic ketone, $C_{13}H_{18}O_4$, recently isolated from lignin, has been identified (by direct synthesis and mixed melting-point determination) as alpha-ethoxypropioveratrone, which melts at 81 deg. to 82 deg. C., and which gives a 2,4-dinitrophenylhydrazone melting at 134 deg. to 126 deg. C.—A.P.-C.

The Structure of Lignin. M. J. Hunter, A. B. Cramer and Harold Hibbert. J.Am.Chem.Soc. 60: 2815-2816 (Nov., 1938).—By extraction of maple wood with suitable organic solvents there was obtained a mixture of two ketones, having in the pure state the empirical formulas $C_{12}H_{16}O_4$ and $C_{13}H_{18}O_5$, respectively, which can be readily separated by conversion into their para-nitrobenzoates. They are apparently present in approximately equal amounts. This confirms the previously reported conclusions that hard woods differ from soft in having present in the building unit of its lignin not only the guaiacyl, but also the syringyl, radical.—A.P.-C.

Studies on Lignin and Related Compounds. XXXV. The Ethanolysis of Spruce Wood. A. B. Cramer, M. J. Hunter and Harold Hibbert. J.Am.Chem.Soc. 61: 509-516 (Feb., 1939).—Ethanolysis of spruce wood with ethanol-hydrochloric acid gives, in addition to the water-insoluble "ethanol lignin," a mixture of distillable oils in amount equal to about 8.2 per cent of the weight of Klason lignin present in the original wood. The mixture contains aldehydic, acidic, phenolic and neutral products. The principal constituent has been identified by analysis and synthesis as alpha-ethoxypropioveratrone. Evidence is adduced to show that this product is probably derived from alpha-hydroxypropiovanillone either present as such as the wood, or formed as a fission product from a relatively simple molecular complex. It is suggested that this derivative (alpha-hydroxypropiovanillone), or a dismutation isomer of it, forms the true building unit from which "extracted" lignins from soft woods are derived by condensation-polymerization reactions brought about by the extractant.—A.P.-C.

Studies on Lignin and Related Compounds. XXXVI. Ethanolysis of Maple Wood. M. J. Hunter, A. B. Cramer and Harold Hibbert. J.Am.Chem. Soc. 61: 516-520 (Feb., 1939).—Ethanolysis of maple wood with ethanol-hydrochloric acid gives, in addition to the water-insoluble "ethanol lignin," a mixture of distillate oils in amount equal to around 20 per cent of the weight of Klason lignin present in the original wood. The mixture contains aldehydic, acidic, phenolic and neutral products. The principal constituents of the phenolic fraction have been identified by analysis and synthesis as alpha-ethoxypropioveratrone and alpha-ethoxypropiosyringone. These products are in all probability derived from the corresponding hydroxy derivatives either present as such, or formed as fission products from a relatively simple molecular complex. It is suggested that these derivatives (alpha-hydroxypropiovanillone and alpha-hydroxypropiosyringone), or their dismutation isomers, form the true building units of which native lignins are composed, or from which "extracted" lignins from hard woods are derived by condensation-polymerization reactions brought about by the reactant.—A.P.-C.

Studies on Lignin and Related Compounds. XXXVII. The Structure of Lignin and the Nature of Plant Systhesis. Harold Hibbert. J.Am.Chem.-Soc. 61: 725-731 (March, 1939).—A new theory of plant synthesis is proposed in which methyl glyoxal, or its dismutation isomers, formed during plant metabolism, is postulated as the key substance concerned in the formation of lignins, tannins and pigments. It is considered that methyl glyoxal readily can undergo transformation to a dimeric cyclic ketone, the result of an intermolecular aldol condensation reaction. Both monomer and dimer can then further react with guaiacol, for example, to give C_6-C_3 and C_6-C_6-C_6 systems. On the basis of new experimental evidence it seems likely that

there are present four types of "lignin" in wood, corresponding to: (a) the simple C_6-C_3 unit; (b) the simple C_6-C_3-C_6 unit; (c) reversible polymers of (a) and (b); (d) irreversible polymers of (a) and (b.) "Extracted" lignins correspond to types (c) and (d). The marked difference existing between spruce and maple woods in regard to the amounts of extractible, water-soluble-"ethanolysis" products points to a fundamental difference between the lignin constituents of soft and hard woods, and is explainable on the assumption of the syringyl building units present only in hard woods to undergo condensation to irreversible condensation polymers. It is suggested that tannins and pigments originate in the plant as a result of a series of related condensation reactions between phenols and a C_6-C_3 unit, the latter arising from condensation reactions between methyl glyoxal and a phenol. The possibility that the lignin building-unit may be formed in the plant through the agency of a "carboligases enzyme" reaction from vanillin and acetaldehyde is pointed out.—A.P.-C.

Studies on Lignin and Related Compounds. XXXVIII. The Effect of Solvents in the Grignard Analysis for Active Hydrogen and Carbonyl. Morris Lieff, George F. Wright and Harold Hibbert. J.Am.Chem.Soc. 61: 865-7 (April, 1939).—It is shown that pyridine as a solvent for quantitative determination of active hydrogen and carbonyl in the Grignard analysis gives more uniform results than dioxane. Comparison of the analytical data shows that the solvent apparently affects the behavior of the substance analyzed.—A.P.-C.

Studies on Lignin and Related Compounds. XXXIX. The Ethanolysis of Spruce and Maple Woods. Leo Brickman, James J. Pyle, Joseph L. McCarthy and Harold Hibbert. J.Am.Chem.Soc. 61: 868-869 (April, 1939).—A description is given of an improved method for the extraction and isolation of water-soluble ethanolysis products from spruce and maple woods. Preliminary results are included showing that ethanolysis "oils" can be obtained from all types of ligneous plant materials as yet investigated. These preliminary results indicate that the ethanolysis method is broadly applicable as a means of isolating in high yield the building units from the lignin of a wide variety of plant types.—A.P.-C.

The Aldehydic Constituents From the Ethanolysis of Spruce and Maple Woods. Leo Brickman, James J. Pyle and Harold Hibbert. J.Am.Chem.-Soc. 61: 523 (Feb., 1939).—The aldehyde of the ethanolysis products of maple wood yields a semicarbazone, $C_{12}H_{17}O_5N_3$, which melts at 210° to 210.5°C. A similar semicarbazone has been isolated from spruce wood. Possible formulas are suggested.—A.P.-C.

The Sulphite Cooking Process. II. The Reaction Between Thioglycolic Acid and Spruce Lignin. C. E. Ahlm and F. E. Brauns. J.Am.Chem.Soc. 61: 277-280 (Feb., 1939).—Thioglycolic acid spruce lignin was methylated with (a) diazomethane, (b) dimethyl sulphate and sodium hydroxide, and (c) dimethyl sulphate followed by diazomethane. Saponification of the diazomethane-methylated thioglycolic acid lignin, as well as the methylation with dimethyl sulphate, resulted in the splitting off of a part of the thioglycolic groups. The results of the investigation do not indicate that, with the entrance of each thioglycolic group into the lignin molecule, a new hydroxyl group is formed, nor that a hydroxyl group of the lignin has disappeared. On reaction of thioglycolic acid lignin with phenol, a part of the thioglycolic groups is replaced by a phenol group.—A.P.-C.

Reconversion of an "Extracted" Lignin into its Primary Building Units. Quintin P. Peniston, Joseph L. McCarthy and Harold Hibbert. J.Am. Chem.Soc. 61: 530 (Feb., 1939).—An acetylated oak lignin (8.7 per cent methoxyl, 35 per cent acetyl) refluxed for 15 hrs. with absolute ethanol containing 2 per cent of hydrogen chloride, gives a crude oil (36 per cent of the acetyl-free lignin content of the starting material), separated into four fractions: 4.8 per cent bisulphite-soluble, 6.3 per cent bicarbonate-soluble, 49.2 per cent of sodium hydroxide-soluble, and 20.2 per cent neutral. Thus, an "extracted" lignin has been reconverted into what are apparently primary building units.—A.P.-C.

Action of Cuproxide-Ethylenediamine Solution on Wood and Straw. Richard S. Hilpert and Joachim Pfützenreuter. Ber. 73, no. 3:607-610 (March 8, 1939); B. I. P. C. 9:347.—When wood or straw is extracted with cuproxide-ethylenediamine solution, approximately 50 per cent of deciduous woods, 10-20 per cent of coniferous woods, and up to 85 per cent of stray is dissolved, leaving a residue of the same elementary composition as the starting material with the exception of a certain increase of the methoxyl content. From the dissolved portion, a part only can be precipitated by acids, indicating that a part has been rendered water-soluble. From these results it is concluded that the previous theory of the existence of cellulose and lignin in plant materials still holds.—C.J. **W.**

Machinery

Device for Cleaning Paper Machine Rolls and Wires. Rohrbacker Lederfabrik Jos. Poeschl's Sohne A. G. Belg. pat. 426,381 (March 31, 1938).—The portion of the doctor blades which comes into contact with the surface to be cleaned is composed of leather.—A.P.-C.

Press Roll of Rubber or Similar Materials Capable of Vulcanization, for the Manufacture of Paper or Similar Materials. Continental Gummi Werke A. G., Hannover. Ger. pat. 655,188 (Oct. 20, 1934).—Metal particles with rough, strongly fissured surface are mixed with the rubber or material capable of vulcanization, before vulcanization, before vulcanization of the material used.—J.F.O.

Process for the Screening of Suspensions of Fibers, Especially Solutions of Pulp. Linkopings Armatur och Metallfabriks A. B., Linkoping. Nor. pat. 59,399 (Feb. 5, 1936).—J.F.O.

Device for the Automatic Regulation of the Screened Material Exit of Flat Screens. O. Imset, Oslo. Ger. pat. 659,798 (March 6, 1936).—J.F.O.

Shower Pipe for the Cleaning of Screens, Knotter and Similar Apparatus on Paper and Similar Machines. Apparatebau Gesellschaft m.b.H., Frankfurt a.M. Ger. pat. 657,506 (Oct. 6, 1936).—Means are provided for causing a turbulence within the pipe.—J.F.O.

Imports of Paper and Paper Making Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING FEBRUARY 10, 1940

SUMMARY

Wall paper .....16 bls.
Paper hangings .....33 bls.
Newsprint .....552 rolls
Wrapping paper .....16 cs., 50 pkgs.
Packing paper .....100 bls.
Filter paper .....35 bls.
Surface coated paper .....84 cs.
Basic paper .....15 cs.
Photo material .....154 cs.

WALL PAPER

——, *Herdis,* Antwerp, 16 bls.

PAPER HANGING

——, *Herdis,* Antwerp, 33 bls.

NEWSPRINT

National Pulp & Paper Co., *Bergensfjord,* Oslo, 552 rolls.

WRAPPING PAPER

F. C. Strype, *Jean Jadot,* Antwerp, 16 cs.
——, *Brynhild,* Copenhagen, 50 pkgs.

PACKING PAPER

T. Matchett, *Jean Jadot,* Antwerp, 100 bls.

FILTER PAPER

W. I. Chudleigh, *Kongsfjord,* Bordeaux, 35 bls.

SURFACE COATED PAPER

Gevaert Co. of America, *Herdis,* Antwerp, 44 cs., (unfinished photo-paper).
W. I. Chudleigh, *Herdit,* Antwerp, 13 cs.
W. I. Chudleigh, *Westernland,* Antwerp, 27 cs.

BASIC PAPER

P. Puttmann, *Westernland,* Antwerp, 15 cs.

PHOTO MATERIAL

Gavaert Co. of America, *Jean Jadot,* Antwerp, 154 cs.

RAGS, BAGGINGS, etc.

E. J. Keller Co., Inc., *Excalibur,* ——, 340 bls. cotton rags.
J. Rosenberg, *Excalibur,* Alexandria, 77 bls. old bagging.
Continental Bank Trust Co., *Excalibur,* Alexandria, 40 bls., paper stock.
Darmstadt Scott & Courtney, *Westernland,* Antwerp, 774 bls. flax waste.
Castle & Overton, Inc., *Mormacsea,* Buenos Ayres, 151 bls. bagging.
J. Levy & Son, *Mexico,* Havana, 18 bls., 10 bags rags.
Irving Trust Co., *Mexico,* Vera Cruz, 73 bls. rags.
National City Bank, *Uruguay,* Buenos Ayres, 5 bls. rags.
E. J. Keller Co., Inc., *Jean Jadot,* ——, 160 bls. old bagging.
Darmstadt Scott & Courtney, *Jean Jadot,* Antwerp, 131 bls. jute card waste.
Commercial Bank of Greece, *Nea Hellas,* Piraeus, 225 bls. jute bagging rags, 395 bls. old cotton rags.
Camden Fibre Mills, ——, Bombay, 400 bls. cotton waste.
Green Textile Associates, ——, Bombay, 100 bls. cotton waste.
Irving Trust Co., ——, Bombay, 525 bls. rags.
Castle & Overton, Inc., ——, Bombay, 525 bls. rags.

CASEIN

American British Chemical Supplies, *Santos,* Buenos Ayres, 1000 bags, 50,000 kilos.
Packing Products Co., *Santos,* Buenos Ayres, 500 bags, 30,000 kilos.
——, *Uruguay,* Buenos Ayres, 417 bags.
Tupman Thurlow Sales Co., *Uruguay,* Buenos Ayres, 250 bags.
——, *Mormachawk,* Buenos Ayres, 451 bags.

WOOD PULP

E. M. Sergeant Pulp & Chemical Co., *Bergensfjord,* Oslo, 250 bls. dry bleached sulphite, 50 tons.
——, *Inger,* Wallvik, 4500 bls. dry sulphite, 750 tons; 7800 bls. dry sulphate, 1300 tons.

PORTLAND IMPORTS

WEEK ENDING FEBRUARY 10, 1940

Pagel Horton & Co., Inc., *Korsholm,* Sweden, 15,885 bls. wood pulp.

BOSTON IMPORTS

WEEK ENDING FEBRUARY 10, 1940

American British Chemical Supplies, *Mormahawk,* Buenos Ayres, 417 bags casein, 25,020 kilos.
Pagel Horton & Co., Inc., *Korsholm,* Sweden, 300 bls. woodpulp.
Pagel Horton & Co., Inc., *Tunaholm,* Sweden, 750 bls. woodpulp.

PHILADELPHIA IMPORTS

WEEK ENDING FEBRUARY 10, 1940

——, *Mormachawk,* Buenos Ayres, 334 bags casein.
Glant & Co., ——, Bombay, 125 bls. rags.
Irving Trust Co., ——, Bombay, 42 bls. scrap string.

NORFOLK IMPORTS

WEEK ENDING FEBRUARY 10, 1940

Irving Trust Co., *Herdis,* Antwerp, 176 bls. bagging.
——, *Mormachawk,* Buenos Ayres, 417 bags casein.

LOS ANGELES IMPORTS

WEEK ENDING FEBRUARY 10, 1940

——, *Annie Johnson,* Norrkoping, 294 rolls newsprint.

Buys Andrews Paper Co. at Pittston

PITTSTON, Pa., February 13, 1940—Stock and equipment of the Andrews Paper Company conducting a wholesale paper business on Dock street, were sold at public sale early this month by Attorney William H. Gillespie as executor of the estate of Charles R. Andrews to the Williamsport Paper and Supply Company of Williamsport, Pa., for $15,100. The building occupied by the business was not included in the sale.

The Williamsport Paper and Supply Company has been established in Williamsport for a number of years and has an extensive trade.

Saxon Paper Products, Inc. Removes

Saxon Paper Products, Inc. have moved to new quarters at 240 W. 18th street, New York City, telephone Chelsea 2-3100. The company announces that, with greater facilities and more modern equipment, it is in a position to serve its customers better than ever before.

Tissue Association To Meet at Waldorf

The annual meeting of the board of governors of the Tissue Association, with E. W. Kiefer, president of the Port Huron Sulphite Paper Company, Port Huron, Mich., presiding as vice-president of the Tissue Association, opens at the offices of the Tissue Association, 19 West 44th street, New York City at 10:30 A. M., Saturday, February 17. Throughout the week, divisional meetings of the Interfold, Roll Toilet Paper Towel, Wrapping Paper Napkin, Waxing and Jumbo Roll divisions will be held concluding with the election of officers at the annual meeting in the Carpenter Suite at the Waldorf-Astoria Hotel.

Ross A. Fife, executive secretary, of the Tissue Association, states that the board of governors will present their recommended budget with a comprehensive charted industry plan for 1940. The association reports growing interest in association activities indicated by increased membership and interest in meetings. Increased effectveness through the proposed centralization of divisional paper associations of the American Paper and Pulp Association is anticipated for the New Year. Business conditions for the closing of 1939 show marked improvement in earnings with volume holding well. Predictions are for substantial improvement by the end of the first quarter of 1940 with increasingly firmer markets.

C. H. Backus To Act as Sales Manager

The Smith & Winchester Manufacturing Company, South Windham, Conn., has sent out the following announcement which is self-explanatory: "We announce the retirement on February 1, 1940 of Byron R. Cleveland, who has been connected with our Company since 1930, as its Sales Manager; and we wish to express our appreciation for your valued patronage.

"While the appointment of Mr. Cleveland's successor has not as yet been made, we wish to assure our many customers and friends among the Paper mills and paper bag industry, that our engineering department will give to your orders and problems the same efficient and prompt attention as has been our custom. Charles H. Backus who has been associated with this company for over twenty years in connection with the design and application of paper mill equipment, will carry on for the present, the duties which Mr. Cleveland has relinquished, and we will consider it a privilege to receive your inquiries and orders for quality paper mill, and paper bag making machinery."

Floyd H. Blackman Convalescing

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 12, 1940—Floyd H. Blackman, president of the D. F. Munroe Company, who recently underwent an operation, has returned to his home in Brookline and is convalescing.

Emor Paper Co. Moves

The Emor Paper Company, mill agent, has moved from 34 E. 12th street to room 1606, 175 5th avenue, New York.

Piermont Mill Installs New Filter

Although for years the Robert Gair Company, Inc., has endeavored to keep abreast of the latest papermaking devices available for the greatest efficiency and economy in the application of various fibers to paper making, with a constant decrease in the loss of materials in the waste water from the mill, probably the greatest advance in scientific improvement has come about in the last year through the installation just completed at the Piermont Division of an automatic, self-cleaning sand filter.

Like many other industries, in its early days the value of by-products was not recognized by the paper industry and many thousands of dollars went down the sewer in the form of heat units, retrievable fibers, chemicals, etc. Today it is realized that, in order to achieve the ultimate efficiency, the waste water from a mill must be practically as clear as the intake water, and this new automatic, self-cleaning Sand Filter makes this possible.

This installation consists of a large sedimentation tank, about 40 x 10 feet, large enough to allow the normal flow of 2,000 gallons a minute to remain in this settling tank for a period of twenty minutes. Most of the floating solids, composed principally of cellulose fibers and clay, sink to the bottom of this settling tank and are removed and pumped back to the mill. The fluid is then pumped to the Sand Filter tank, about 60 x 10 feet, and is required to go through a thick bed of sand.

Sand has been recognized for hundreds of years as one of the safest and most effective filters, but it has always been difficult to keep the sand clean. In this new installation, there are self-cleaning devices which take off any solids which may have escaped the settling tank and those too are pumped back to the mill. The net result of this installation is that fluids passing through both the sedimentation tank and the sand filter emerge as clear as the water taken into the mill for the making of the paperboard.

Specialty Paperboard Mill Busy

The former mills of the Analomink Paper Company located at Minisink Hills, Pa., have been operating on a full schedule for the last few months and a greatly increased capacity will be insured within a few weeks when the addition of new power equipment will have been completed.

The mill is now owned by the Specialty Paperboard Mills Inc., of Stroudsburg, Pa.

Mr. Clarence Forman is superintendent and at the present time there are about 20 men employed on a six day basis producing about fifteen tons daily of Bogus news, Bristols and nine point corrugating.

New York sales office and headquarters are located at 175 Fifth Ave., New York City.

Dee & Anderson Add to Lines

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 12, 1940—Dee & Anderson, manufacturers' representatives, have added to their lines waxed unprinted and printed paper bags, made by the Monoca Bag and Manufacturing Company, Inc., and napkins, toilet tissues and towels, made by the Badger Tissue Mills, Kaukauna, Wis.

New York Paper and Pulp Market Review

Sales Volume of Many Grades of Paper and Paper Products Continues Relatively Good and Above Like Week Last Year—Demand For Wood Pulp Less Active, Prices Firm and Unchanged — Other Markets Steady.

Office of the PAPER TRADE JOURNAL,
Wednesday, February 14, 1940.

Somewhat less activity in the wholesale paper market during the current week is reflected in reports received from many manufacturers' representatives, jobbers, and general paper merchants. The index of general business activity declined to 101.5 per cent for the week ended February 3, from 103.1 per cent for the preceding week, compared with 90.4 per cent for the corresponding week last year.

Paper production of 186 mills for the week ended February 3 declined to 87.8 per cent, compared with 80.7 per cent for 1939, with 66.0 per cent for 1938, with 88.1 per cent for 1937, and with 77.5 per cent for the corresponding week in 1936.

Paper board production for the week ended February 3 was 72.0 per cent, compared with 66.0 per cent in 1939, with 59.0 per cent in 1938, with 86.0 per cent in 1937, and with 66.0 per cent for the corresponding week in 1936.

No important change has been reported in the newsprint market this week. Retail advertising linage in newspapers in 80 leading cities for the week ended February 3 is reported to be up 0.9 per cent above the like week last year. The linage for the last reported week was 16,154,655 lines, compared with 16,011,833 lines for the corresponding week in 1939. New York City newspapers were off 7.5 per cent for the cited week.

The decline in sales volume in many kinds of paper is reported to continue for the current week, with many in the trade holding the view that the trade outlook is favorable and reflecting optimism for the future. The prevailing opinion in the wholesale market is that a substantial improvement may be expected quite early in the Spring.

Despite the relatively small decline in sales volume reported during the current week, sales are generally well maintained and at a higher level than this period last year. The demand for kraft paper continues good. Prices on all grades of paper and paper board are firm and no important changes have been reported during the current week.

Mechanical Pulp

Somewhat less activity is reported in the demand for mechanical pulp this week. Prices hold firm with no change from prevailing representative market quotations reported on domestic or imported mechanical pulp.

Chemical Pulp

Demand for all grades of domestic and imported pulp is reported as a little less active during the current week. Prices hold firm and unchanged. Domestic production of all grades of wood pulp for 1939 is estimated at 5,798,833 tons; total imports, 2,026,209, total exports, 139,504 tons. Imports from Sweden for the full year of 1939 totaled 870,813 tons; from Canada, 641,090 tons; from Finland, 355,717 tons; from Norway, 95,682 tons, and from Germany, 21,290 tons.

Rags

The export activity in No. 1 white shirt cuttings has declined and export trade is now relatively quiet. Domestic mill demand is also relatively quiet. Prices on all grades of new and old rags are unchanged, with a steady demand reported in the roofing grades.

Old Rope and Bagging

The old rope market continues strong, based largely upon a reported dwindling of supplies. The trade continues to expect higher prices but no change from current representative market quotations has been reported for the week.

The old bagging market is firm with no improvement in mill buying reported this week. All bagging prices are firm and unchanged.

Old Waste Paper

Although mill buying is reported as slow, old waste paper prices in this market are firm and continue unchanged. The only important change reported to date is on new Manila envelope cuttings which are lower and currently quoted at from 1:30 to 1:40.

Twine

Prices on all grades of twine continue firm and unchanged at prevailing market quotations. Current demand is reported in some quarters of the trade as well above the like period last year. The trade outlook is generally viewed as favorable.

Thomas Wilson Dead

Thomas Wilson, for many years prominently connected with the paper industry in this country and in Canada, died February 8 at Bennington, N. H., two months after his one hundredth birthday.

Born December 8, 1839, he emigrated to Canada in 1872 from Glasgow, Scotland. He designed and constructed the paper mill of J. C. Wilson & Sons at Lachute, P. Q. In 1888 he came to the United States and was employed as millwright in the mills of W. G. Hamilton & Sons, Philadelphia, later with the Grove Mills of Newburgh, N. Y., and the Monadnock Mills in Bennington, N. H. He retired at the age of 72 and had been living in Bennington, N. H., since that time.

He is survived by his widow, aged 94, by six daughters and by Robert Wilson, president of the Robert Wilson Paper Corporation, 90 White street, New York.

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL.
Wednesday, February 14, 1940.

BLANC FIXE—Prices on blanc fixe are firm under a moderately good demand. The pulp is currently quoted at $35 per ton, in barrels, at works. The powder is offered at $50 per ton, in bags, at works.

BLEACHING POWDER—Quotations on bleaching powder are firm and continue unchanged at prevailing market prices. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—The demand for casein is reported as less active for the week, with prices a little lower. Standard domestic casein, 20-30 mesh, is currently quoted at 13 cents per pound; 80-100 mesh, at 13½ cents per pound. All prices in bags, car lots. Standard Argentina casein is offered at 12 cents per pound. French casein is currently quoted at 16 cents per pound.

CAUSTIC SODA—Prices on caustic soda are firm under a moderately active demand. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay are firm and unchanged at prevailing market prices. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is quoted at from $13.50 to $25 per ton, ship side.

CHLORINE—Prices on chlorine are firm under a moderately active demand. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported as firm for the week. Prices on some grades are a little higher. "G" gum rosin is currently quoted at $5.40 per 280 pounds, gross weight, in barrels, Savannah. "FF" wood rosin is quoted at $5.20 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is offered at $2.87 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Prices on salt cake are firm under a steady demand and continue nominal. Domestic salt cake is currently quoted at $17 per ton, in bulk; chrome salt cake at $16 per ton; all prices in car lots, f.o.b., shipping point. The quotation of $20 per ton on imported salt cake continues nominal.

SODA ASH—Quotations on soda ash are firm and unchanged at prevailing market levels. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are unchanged for the week at prevailing market levels. Globe pearl is currently quoted at $2.50 per 100 pounds; special paper starch at $2.60 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm and unchanged under a steady demand at prevailing market prices. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.45 per 100 pounds, in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are unchanged and conform to prevailing market quotations. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Quotations on talc continue unchanged at prevailing market levels. Domestic talc is currently quoted at from $15 to $18 per ton, Eastern mines. Imported talc is quoted at from $23 to $45 per ton.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.00	@	$5.50
Superstandard	4.62½	"	5.00
Northern Standard Wrapping	4.25	"	4.62½
Standard Wrapping	4.00	"	—
Tissues—Per Ream—Carlots			
White No. 1	.92½	@	—
White No. 1 M. G.	.90	"	—
White No. 1½	.70	"	—
White No. 2	.65	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.87½	"	—
Kraft	.80	"	—
Manila	.65	"	—
Unbl. Toilet, 1 M.	3.50	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	1.95	@	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	45.00	@	—
Chip	45.00	"	—
Sgl. Mla. Ll. Chip	57.50	"	—
Jute Lined Chip	57.50	"	—
White Pat. Coated	70.00	"	—
Kraft Liners	55.00	"	—
Binders Boards	76.00	"	87.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1	$39.10 @	$46.00	$40.25 @	$47.25
100% Rag	31.05 "	36.50	32.20 "	37.75
85% Rag	.... "	....	29.90 "	35.00
75% Rag	23.60 "	27.75	24.75 "	29.00
65% Rag	.... "	....	21.65 "	26.25
50% Rag	17.55 "	21.50	18.70 "	22.75
25% Rag	14.65 "	17.75	15.80 "	19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$8.95 @	$11.00	$10.10 @	$12.25
No. 2	8.05 "	9.75	9.25 "	11.25
No. 3	7.60 "	9.25	8.50 "	10.75
No. 4	7.30 "	9.00	8.50 "	10.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.90 @	$13.50	
No. 2 Glossy Coated	10.35 "	11.75	
No. 3 Glossy Coated	9.55 "	11.00	
No. 4 Glossy Coated	9.15 "	10.50	
No. 1 Antique (watermarked)	8.35 "	9.50	
No. 2 Offset	7.70 "	9.00	
A Grade E. F.	7.50 "	8.75	
A Grade S. & S. C.	7.75 "	9.00	
B Grade E. F.	6.95 "	8.00	
B Grade S. & S. C.	7.20 "	8.25	
C Grade E. F.	6.65 "	7.75	
C Grade S. & S. C.	6.90 "	8.00	
D Grade E. F.	6.40 "	7.50	
D Grade S. & S. C.	6.65 "	7.75	

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	$38.00	@	44.00
Dry	38.00	"	44.00
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.00	@	3.40
Prime Qualities—			
Easy-Bleaching Sulphite	2.75	"	2.95
Strong Unbleached Sulphite	2.75	"	2.85
(On Dock, Atlantic Ports)			
Kraft Bleached	3.00	@	3.50
Kraft Light & Strong	2.50	"	2.75
Kraft No. 1	2.40	"	2.65
(F. o. b. Pulp Mill)			
Kraft Domestic	1.80	"	2.12½
(Delivered)			
Soda Bleached	2.90	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1.	7.50	@	7.75
Silesias No. 1	4.50	"	4.75
New Unbleached	7.50	"	7.75
Blue Overall	5.00	"	5.25
Fancy	2.25	"	2.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.25	"	3.50

Old Rags

White, No. 1—			
Repacked	3.25	"	3.50
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.75	"	1.90
Roofing Rags—			
No. 1	1.50	"	1.55
No. 2	1.20	"	1.27½
No. 3 (bagging)	1.50	"	1.60
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

All prices nominal.

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

J. Andersen & Co.

Selling Agents

21 East 40th Street

New York

CHEMICAL & MECHANICAL PULP

Kraft Pulp

BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
KALIX TRÄINDUSTRI AKTIEBOLAG
Venaffärden, Sweden
MUNKSUNDS AKTIEBOLAG
Munksund, Sweden
NENSJÖ CELLULOSA A.-B.
Sprängsvikten, Sweden

Bleached Sulphite

KELLNER-PARTINGTON PAPER PULP CO., LTD.
Sarpsborg, Norway
Edmvalla, Sweden
Hallsta & Vilback, Austria

Unbleached Sulphite

AKTIESELSKABET GREAKER CELLULOSEFABRIK
Greaker, Norway
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
CELLULOSEFABRIKS A.-G.
Bratislava, Czecho-Slovakia
SVANÖ AKTIEBOLAG
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No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens..	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.50	@	2.75
Domestic	2.25	"	2.50
Wool Tares, light...	1.75	"	2.00
Wool Tares, heavy..	1.80	"	1.90
Bright Bagging.....	2.25	"	2.50
Manila Rope—			
Foreign	4.25	"	4.50
Domestic	4.25	"	4.50
Jute Threads.....	3.00	"	3.25
Sisal Strings.....	2.00	"	2.25
Mixed Strings.....	.70	"	.85

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1..	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag....	1.00	"	1.10
Solid Flat Book...	.80	"	.90
Crumbled No. 1...	.70	"	.75
Ledger White Stock.	1.75	"	1.85
Ledger Stock Colored	1.05	"	1.15
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.30	"	1.40
Old Kraft Machine—			
Compressed bales..	1.35	"	1.40
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.47½	"	.52½
Corrugated	.60	"	.65
No. 1 Mixed Paper..	.27½	"	.32½

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18½	@	—
White Hemp.....	.18½	"	—
Fine Polished—			
Fine India.....	.23	"	—
Unpolished—			
Box	.14¾	"	—
Paper Makers.....	.15	"	—
Tube Rope.....	.16¾	"	—
Wall Paper.....	.15¾	"	—
Wrapping	.18	"	—
Soft Fiber Rope...	.16¾	"	—
Cotton	.21	"	—

(Hard Fiber)

Medium Java.....	.19	"	—
Mex. Sisal.....	.16	"	—
Manila	.24	"	—
Domestic	4.00	@	4.50
Sisal Rope.....	2.25	"	2.65
Mixed Rope	.75	"	1.00
Transmission Rope..	3.00	"	3.50
Soft Jute Ropes.....	3.00	"	3.50
Jute Carpet Threads.	1.25	"	1.50
Gunny Bagging—			
Foreign	3.00	@	—
Domestic	2.45	"	2.50
Bleachery Burlap....	3.50	"	3.75
Scrap Burlap—			
Foreign	2.40	"	2.50
Domestic	2.00	"	2.25
Scrap Sisal.....	2.25	"	2.50
Scrap Sisal for Shredding	2.50	"	2.75
Wool Tares, Heavy..	2.50	"	2.60
New Burlap Cuttings	3.25	"	3.50
Aust. Wool Pouches.	3.25	"	3.50
Heavy baling bagging	2.85	"	3.00
Paper Mill Bagging..	1.25	"	1.50
No. 2 Bagging	1.10	"	1.25

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1...	.08	"	.08¼
New Light Flannelettes	.05	"	—
Silesias No. 1	.05	"	—
New Black Silesias..	.03½	"	03¾
Soft Unbleached....	7.50	"	8.00
Blue Cheviots	.05½	"	.06
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to grades—			
Blue Overalls	.05¼	"	.05½
New Black, soft ..	.03¼	@	.04
Khaki Cuttings	.02½	"	.03
O. D. Khaki	03	"	.03¼
Corduroy	.02¾	"	.03
New Canvas.....	.06¾	"	.07¼
B. V. D. Cuttings...	.07	"	.07¼

Domestic Rags (Old)

(F. o.b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	"	2.75
Miscellaneous	2.50	"	2.75
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues	2.25	"	2.50
Old Blue Overalls ..	1.60	"	2.00
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.50	"	1.60
Black Stockings	4.00	"	4.25
Roofing Stock—			
No. 1.....	1.75	"	2.00
No. 2.....	1.60	"	1.65
No. 3.....	1.00	"	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White No. 2.	.04	"	.04½
Light Silesias.....	—	"	.04½
Silesias, No. 1....	—	"	.04½
Black Silesias, soft	—	"	.03¾
New Unbleached..	.05½	"	.06
Washable, No. 1..	—	"	.04
Blue Overall.....	—	"	.05
Cottons—According to grades—			
Washable No. 2...	—	"	.02
New Blue	—	"	.02
Fancy Percales....	—	"	.03
New Black Soft...	—	"	.04
New Light Seconds	.04½	"	.05
New Dark Seconds	—	"	1.55
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.04
No. 2 Mixed.....	.03	"	.03¼
Corduroy	—	"	.02½
New Canvas.....	.05½	"	.06
New Black Mixed.	—	"	.03

Domestic Rags (Old)

White No. 1—			
Repacked	3.25	@	3.75
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	2.00	"	2.25
Repacked	2.50	"	2.75
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1..	1.50	"	1.60
Domestic No. 2....	1.35	"	1.45
Roofing Bagging..	—	"	1.30

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	3.25	"	3.75
Sisal Rope.....	1.75	"	2.00
Mixed Rope.....	1.25	"	1.50
Scrap—			
No. 1.....	2.00	"	2.50
No. 2.....	—	"	1.30
Wool Tares, heavy..	3.50	"	3.70
Mixed Strings	.75	"	1.00
No. 1 New Light Burlap	3.00	"	3.50
New Burlap Cuttings	2.00	"	2.25

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard Write	2.25	@	2.30
No 2 Hard White	2.00	"	2.10
No. 1 Soft White	1.85	"	1.90
No. 2 Soft White	1.50	"	1.60
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.50	"	1.60
Ledger Stock, white.	1.40	"	1.45
Ledger Stock, colored	1.10	"	1.20
No. 1 Books, heavy..	.90	"	.95
Manila Cuttings.....	1.75	"	1.80
Print Manila.....	.50	"	.55
Container Manila....	.40	"	.45
Kraft Paper.....	1.00	"	1.10
No. 1 Mixed Paper..	.30	"	.35
Straw Board Chip...	—	"	.40
Binders Board Chip..	.40	"	—
Corrugated Board...	.60	"	.65
Overissue News.....	.70	"	.75
Old Newspapers.....	.50	"	.55

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White	1.85	"	2.15
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.30	"	—
Overissue Ledger Stock	1.30	"	1.50
Mixed Ledgers.....	.85	"	.90
No. 1 Books, heavy..	1.00	"	1.10
No. 1 Books, light..	.65	"	.75
Crumpled Stitchless Book Stock.....	.55	"	.65
Manila Env. Cuttings	1.70	"	1.85
Manila Envelope Cuttings, extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.10	"	1.20
Mixed Papers.....	.35	"	.40
Print Manila.....	.65	"	.70
Container Manila....	.60	"	.70
Old Newspapers....	.60	"	.65
Paper Wool Strings..	.90	"	1.00
Overissue News.....	.70	"	.75
Box Board Chips....	.50	"	.52½
Corrugated Boxes...	.55	"	.65
Kraft corrugated boxes	1.05	"	1.15
Screening Wrappers	.60	"	.70

Bagging

(f.o.b.Boston)

Manila Rope—			
Foreign	5.00	@	5.25

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots.			
No. 1 White $36.50		@	—
No. 1 Tints	37.50	"	—
No. 2 White	26.50	"	—
No. 2 Tints	27.50	"	—
No. 2 Golden Rod..	28.50	"	—
No. 3 White	22.00	"	—
No. 4 White	15.50	"	—
No. 4 Tints	16.50	"	—
No. 4 Golden Rod..	17.50	"	—
Direct mill shipment in three-ton lots.			
No. 5 White $10.40		@	—
No. 5 Tints	11.40	"	—
No. 5 Golden Rod..	12.40	"	—
No. 6 White	9.40	"	—
No. 6 Tints	9.90	"	—
No. 6 Golden Rod..	11.40	"	—
No. 7 White	8.40	"	—
No. 7 Tints	8.90	"	—
No. 7 Golden Rod..	10.40	"	—
Book—			
No. 1 M. F.	$7.75	"	—
No. 2 M. F.	7.25	"	—
No. 3 M. F.	6.60	"	—
No. 1 S. C.	8.25	"	—
No. 2 S. C.	7.75	"	—
No. 3 S. C.	6.25	"	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$12.15		@	—
No. 2	10.50	"	—
No. 3	9.45	"	—
Coated tinted.....	13.20	"	—
Golden Rod.....	14.80	"	—
Wrapping—delivered—			
Rag Brown.....	4.85	"	5.25
White Wrap.....	4.00	"	—
"B" Manila.....	4.90	"	6.15
No. 1 Manila....	$5.50	@	$6.90
Fiber	5.50	"	6.90
Kraft No. 2.....	5.50	"	6.90

(f.o.b. Cars, Toronto)

News per ton—			
Rolls (contract)..	46.00	"	—
Sheets	54.00	"	—

Pulp

Ground wood.....$36.50		@	—
Unbleached sulphite.	54.00	"	—
Bleached sulphite...	64.00	"	—
Kraft	47.50	"	—
Soda	58.00	"	—

Old Waste Paper

(In carload lots, f.o.b. Toronto)

Shavings—			
White Env. Cut..	2.15	@	—
Soft White.....	2.00	"	2.15
White Blk. News..	1.35	"	1.50
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	"	1.00
Light and Crumpled Book Stock.....	.80	"	.90
Ledgers and Writings	1.15	"	—
Manilas—			
New Manila Cut..	1.55	"	1.60
Printed Manilas...	.70	"	—
Kraft	1.15	"	—
News and Scrap—			
Strictly Overissue	.75	"	—
Strictly Folded ..	.70	"	—
No. 1 Mixed Paper	.60	"	—

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings..	2.40	@	—
No. 1 Hard White	2.23	"	—
No. 1 Soft White	2.00	"	—
Ledger and Writings	1.20	"	—
Solid Books.....	.95	"	—
Blanks	1.70	"	—
Krafts	1.00	"	—
New Kraft Cuts.....	1.40	"	—
Overissue News.....	.80	"	—
Old Newspapers—			
No. 1 Folded News	.73	"	—
No. 1 Mixed Paper	.63	"	—
Roofing Stocks—			
No. 1	1.25	@	—
No. 2	1.15	"	—